DRINKING WATER SURVEILLANCE PROGRAM

THAMESVILLE WATER SUPPLY SYSTEM

ANNUAL REPORT 1990

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EXECUTIVE SUMMARY

DRINKING WATER SURVEILLANCE PROGRAM

THAMESVILLE WELL SUPPLY
1990 ANNUAL REPORT

The Drinking Water Surveillance Program (DWSP) for Ontario is a monitoring program providing immediate, reliable, current information on drinking water quality. The DWSP officially began in April 1986 and is designed to eventually include all municipal supplies in Ontario. In 1990, 76 systems were being monitored.

The Thamesville Well Supply uses a groundwater source. The raw water is pumped through a manganese green sand pressure filter for iron and manganese removal and is then chlorinated for disinfection. This plant has a designed capacity of 1.44 x 1000 m^3/day. The Thamesville well supply serves a population of approximately 900.

Water at the plant and at two locations in the distribution system was sampled for the presence of approximately 180 parameters. Parameters were divided into the following groups: bacteriological, inorganic and physical (laboratory chemistry, field chemistry and metals), and organic (chloroaromatics, chlorophenols, pesticides and PCB, phenolics, polyaromatic hydrocarbons, specific pesticides and volatiles). Samples were analyzed for specific pesticides and chlorophenols twice a year in the spring and fall.

Table A is a summary of all results by group.

No known health related guidelines were exceeded.

The Thamesville well supply, for the sample year 1990, produced good quality water and this was maintained in the distribution system.

The process of iron and manganese removal was effective.

The detection of elevated lead in the distribution standing samples would indicate that household taps should be well flushed before water is used for consumption.

TABLE A

DRINKING WATER SURVEILLANCE PROGRAM THAMESVILLE WELL SUPPLY

SUMMARY TABLE BY SCAN

A POSITIVE VALUE DENOTES THAT THE RESULT IS GREATER THAN THE STATISTICAL LIMIT OF DETECTION AND IS QUANTIFIABLE
A '.' INDICATES THAT NO SAMPLE WAS TAKEN

SCAN	SITE RAW TESTS	RAW POSITIVE	RAW %POSITIVE	TREATED TESTS	TREATED POSITIVE	TREATED %POSITIVE	SITE 1 TESTS	SITE 1 POSITIVE	SITE 1 %POSITIVE	SITE 2 TESTS	SITE 2 POSITIVE	SITE 2 %POSITIVE
BACTERIOLOGICAL	27	1	3	9	0	0	4	0	0	5	2	40
CHEMISTRY (FLD)	18	18	100	45	45	100	39	38	97	50	34	68
CHEMISTRY (LAB)	198	165	83	198	146	73	152	134	88	190	160	84
METALS	216	77	35	216	70	32	184	92	50	230	107	46
CHLOROAROMATICS	98	0	0	126	0	0	56	0	0	70	0	0
CHLOROPHENOLS	12	0	0	12	0	0	.	.	.	.	.	.
PAH	152	0	0	152	0	0	.	.	.	17	0	0
PESTICIDES & PCB	253	0	0	308	0	0	84	0	0	107	0	0
PHENOLICS	9	1	11	9	3	33	.	.	.	.	.	.
SPECIFIC PESTICIDES	48	0	0	60	0	0	4	0	0	5	0	0
VOLATILES	261	0	0	261	36	13	116	16	13	145	20	13
TOTAL	1292	262		1396	300		639	280		819	323	

DRINKING WATER SURVEILLANCE PROGRAM

THAMESVILLE WELL SUPPLY
1990 ANNUAL REPORT

INTRODUCTION

The Drinking Water Surveillance Program (DWSP) for Ontario is a monitoring program providing immediate, reliable, current information on drinking water quality. The DWSP officially began in April 1986 and is designed to eventually include all municipal supplies in Ontario. In 1990, 76 systems were being monitored.

Appendix A has a full description of the DWSP.

The DWSP was initiated for the Thamesville water treatment plant in the winter of 1988. Previous annual reports have been published for 1988 and 1989.

PLANT DESCRIPTION

The Thamesville Well Supply uses a groundwater source. The raw water is pumped through a manganese green sand pressure filter for iron and manganese removal and is then chlorinated for disinfection. This plant has a designed capacity of 1.44 x 1000 m^3/day. The Thamesville well supply serves a population of approximately 900.

The sample day flows ranged from 0.30 x 1000 m^3/day to 0.40 x 1000 m^3/day.

General plant information is presented in Table 1 and a schematic of plant processes, chemical addition points and sampling locations in Figure 1.

SAMPLING AND ANALYSES

Sample lines in the plant were flushed prior to sampling to ensure that the water obtained was indicative of its origin and not residual water standing in the sample line.

At all distribution system locations two types of samples were obtained, a standing and a free flow. The standing sample consisted of water that had been in the household plumbing and service connection for a minimum of six hours. These samples were used to make an assessment of the change in the levels of inorganic compounds and metals, due to leaching from, or deposition on, the plumbing system. The only analyses carried out on the standing

samples therefore, were General Chemistry and Metals. The free flow sample represented fresh water from the distribution main, since the sample tap was flushed for five minutes prior to sampling.

Attempts were made to capture the same block of water at each sampling point by taking the retention time into consideration. Retention time was calculated by dividing the volume of water between two sampling points by sample day flow. For example, if it was determined that retention time within the plant was five hours, then there would be a five hour interval between the raw and treated sampling. Similarly, if it was estimated that it took approximately one day for the water to travel from the plant to the distribution system site, this site would be sampled one day after the treated water from the plant.

Stringent DWSP sampling protocols were followed to ensure that all samples were taken in a uniform manner (see Appendix B).

Plant operating personnel routinely analyze parameters for process control (Table 2).

Water at the plant and at two locations in the distribution system was sampled for the presence of approximately 180 parameters. Parameters were divided into the following groups: bacteriological, inorganic and physical (laboratory chemistry, field chemistry and metals), and organic (chloroaromatics, chlorophenols, pesticides and PCB, phenolics, polyaromatic hydrocarbons, specific pesticides and volatiles). Samples were analyzed for specific pesticides and chlorophenols twice a year in the spring and fall. Laboratory analyses were conducted at the Ministry of the Environment facilities in Rexdale, Ontario.

RESULTS

Field measurements were recorded on the day of sampling and were entered onto the DWSP database as submitted by plant personnel.

Table 3 contains information on delay time between raw and treated water sampling, flow rate, and treatment chemical dosages.

Table 4 is a summary break-down of the number of water samples analyzed by parameter and by water type. The number of times that a positive or trace result was detected is also reported.

Positive denotes that the result is greater than the statistical limit of detection established by the Ministry of the Environment laboratory staff and is quantifiable. Trace (<T) denotes that the level measured is greater than the lowest value detectable by the method but lies so close to the detection limit that it cannot be confidently quantified.

Table 5 presents the results for parameters detected on at least one occasion.

Table 6 lists all parameters analyzed in the DWSP.

Associated guidelines and detection limits are also supplied on Tables 5 and 6. Parameters are listed alphabetically within each scan.

DISCUSSION

GENERAL

Water quality was judged by comparison with the Ontario Drinking Water Objectives publication (ODWOs). When an Ontario Drinking Water Objective (ODWO) was not available, guidelines/limits from other agencies were used. These guidelines were obtained from the Parameter Listing System database.

IN THIS REPORT, DISCUSSION IS LIMITED TO:

- **THE TREATED AND DISTRIBUTED WATER;**
- **ONLY THOSE PARAMETERS WITH CONCENTRATIONS ABOVE GUIDELINE VALUES; AND**
- **POSITIVE ORGANIC PARAMETERS DETECTED.**

BACTERIOLOGICAL

Guidelines for bacteriological sampling and testing of a supply are developed to maintain a proper supervision of its bacteriological quality. Routine monitoring programs usually require that multiple samples be collected in a given system. Full interpretation of bacteriological quality cannot be made on the basis of single samples.

Standard plate count is a test used to supplement routine analysis for coliform bacteria. The limit for standard plate count (at 35°C after 48 hours) in the ODWOs is 500 counts/mL (based on a geometric mean of 5 or more samples). DWSP bacteriological analysis of treated and distributed water was limited to standard plate count, which may indicate some deterioration in water quality if the guideline of 500 counts/mL is exceeded.

Standard plate count (membrane filtration) exceeded the ODWO Maximum Desirable Concentration of 500 counts/mL in 1 of 18 treated and distributed water samples, with a maximum reported value of 2,400 counts/mL.

INORGANIC & PHYSICAL

CHEMISTRY (FIELD)

It is desirable that the temperature of drinking water be less than 15°C. The palatability of water is enhanced by its coolness. A temperature below 15°C will tend to reduce the growth of nuisance organisms and hence minimize associated taste, colour, odour and corrosion problems. The temperature of the delivered water may increase in the distribution system due to the warming effect of the soil in late summer and fall and/or as a result of higher temperatures in the source water.

Field temperature exceeded the ODWO Maximum Desirable Concentration of 15°C in 4 of 9 distributed water samples with a maximum reported value of 19.0°C. Treated water temperature did not exceed the guideline, since Thamesville uses a ground water source.

CHEMISTRY (LAB)

Calcium exceeded the European Economic Community (EEC) Aesthetic Guideline Level of 100 mg/L in 11 of 18 treated and distributed water samples with a maximum reported value of 130.0 mg/L.

Colour in drinking water may be due to the presence of natural or synthetic substances as well as certain metallic ions.

Colour exceeded the ODWO Maximum Desirable Concentration of 5 Hazen Units (HZU) in 1 of 18 treated and distributed water samples with a maximum reported value of 5.5 HZU.

Elevated conductivity is often associated with high hardness levels.

Conductivity exceeded the EEC Aesthetic Guideline Level of 400 umho/cm in 18 of 18 treated and distributed water samples with a maximum reported value of 751.0 umho/cm.

Dissolved organic carbon exceeded the ODWO Maximum Desirable Concentration of 5.0 mg/L in 1 of 18 treated and distributed water samples with a maximum reported value of 5.4 mg/L.

The ODWOs indicate that a hardness level of between 80 and 100 mg/L as calcium carbonate for domestic waters provides an acceptable balance between corrosion and encrustation. Water supplies with a hardness greater than 200 mg/L are considered poor and would possess a tendency to form scale deposits and result in excessive soap consumption.

Hardness exceeded the ODWO Aesthetic or Recommended Operational Guideline of 80-100 mg/L in 18 of 18 treated and distributed water samples with a maximum reported value of 403.0 mg/L.

METALS

Although, there are no metals above any guidelines in the treated and flushed distributed water samples, it should be noted that there are consistently elevated lead levels in the standing distribution samples.

ORGANIC

CHLOROAROMATICS

The results of the chloroaromatic scan showed that none were detected above trace levels.

CHLOROPHENOLS

The results of the chlorophenol scan showed that none were detected.

POLYAROMATIC HYDROCARBONS (PAH)

The results of the PAH scan showed that none were detected.

PESTICIDES & PCB

The results of the pesticides & PCB scan showed that none were detected.

PHENOLICS

Phenolic compounds are present in the aquatic environment as a result of natural and/or industrial processes. The ODWOs recommend, as an operational guideline, that phenolic substances in drinking water not exceed 2.0 ug/L. This limit has been set primarily to prevent undesirable taste and odours, particularly in chlorinated water.

Phenolics exceeded the ODWO Aesthetic or Recommended Operational Guideline of 2 ug/L in 1 of 9 treated water samples with a maximum reported value of 3.0 ug/L.

SPECIFIC PESTICIDES

The results of the specific pesticides scan showed that none were detected.

VOLATILES

The detection of benzene, ethylbenzene, toluene and xylenes at low, trace levels may be a laboratory artifact derived from the analytical methodology.

Trihalomethanes (THMs) are produced during the water treatment process and will always occur in chlorinated waters. THMs are comprised of chloroform, chlorodibromomethane and dichlorobromomethane; bromoform occurs occasionally. Results are reported for the individual compounds as well as for total THMs. Only total THMs results are discussed.

Total THMs were found at positive levels in the 18 treated and distributed water samples analyzed with a maximum reported value of 108.3 ug/L. This was below the ODWO Maximum Acceptable Concentration of 350 ug/L.

CONCLUSIONS

The Thamesville well supply, for the sample year 1990, produced good quality water and this was maintained in the distribution system.

The process of iron manganese removal was effective.

No known health related guidelines were exceeded.

The detection of elevated lead in the distribution standing samples would indicate that household taps should be well flushed before water is used for consumption.

FIGURE 1

THAMESVILLE WATER SUPPLY SYSTEM

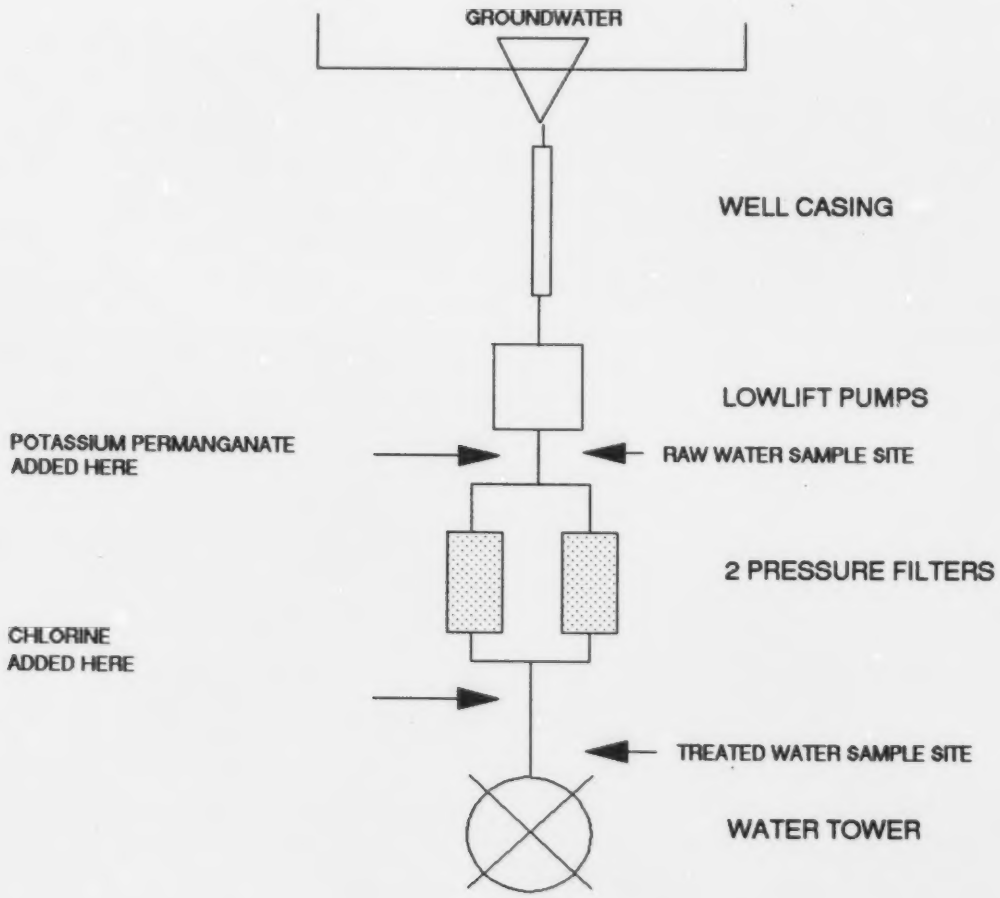

TABLE 1

DRINKING WATER SURVEILLANCE PROGRAM

PLANT GENERAL REPORT

WORKS #: 210001727
PLANT NAME: THAMESVILLE WELL SUPPLY

DISTRICT: WINDSOR
REGION: SOUTHWEST
DISTRICT OFFICER :J. DRUMMOND

UTM #: 174205004710300

PLANT SUPERINTENDENT: JOHN WILSON

ADDRESS: P O BOX 220
THAMESVILLE,ONTARIO
N0P 2K0
(519 692 5377)

MUNICIPALITY: THAMESVILLE
AUTHORITY: PROVINCIAL

PLANT INFORMATION

PLANT VOLUME:	-	(X 1000 M3)
DESIGN CAPACITY:	1.44	(X 1000 M3/DAY)
RATED CAPACITY:	-	(X 1000 M3/DAY)

MUNICIPALITY	POPULATION
THAMESVILLE	900

TABLE 2
DRINKING WATER SURVEILLANCE PROGRAM
IN-PLANT MONITORING

PARAMETER	LOCATION	FREQUENCY
COMBINED CHLORINE RESIDUAL	TREATED WATER	VARIABLE
FREE CHLORINE RESIDUAL	TREATED WATER	VARIABLE
TOTAL CHLORINE RESIDUAL	TREATED WATER	VARIABLE
IRON RESIDUAL	RAW WATER	VARIABLE
	TREATED WATER	VARIABLE

TABLE 3

DRINKING WATER SURVEILLANCE PROGRAM THAMESVILLE WELL SUPPLY SAMPLE DAY CONDITIONS FOR 1990

			TREATMENT CHEMICAL DOSAGES (MG/L)	
			IRON,MANGANESE REMOVAL	POST CHLORINATION
			POTASSIUM PERMANGANATE	CHLORINE
DATE	DELAY * TIME(HRS)	FLOW (1000M3)		
JAN 16	.20	.300	2.40	3.90
FEB 19	.20	.369	2.40	3.90
MAR 20	.20	.350	2.40	3.90
MAY 28	.20	.300	2.40	3.90
JUN 27	.20	.400	2.40	3.40
JUL 18	.20	.350	2.40	3.90
AUG 27	.20	.300	2.40	3.90
OCT 16	.20	.400	2.40	3.90
DEC 18	.20	.300	2.40	3.50

* THE DELAY TIME BETWEEN THE RAW AND TREATED WATER SAMPLING, SHOULD ESTIMATE THE RETENTION TIME.

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM THAMESVILLE WELL SUPPLY
SUMMARY TABLE OF RESULTS (1990)

SCAN PARAMETER	RAW			TREATED			SITE 1			SITE 2		
	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
BACTERIOLOGICAL												
FECAL COLIFORM MF	9	0	0	.	.	.	.	.	.	.	.	.
STANDRD PLATE CNT MF	.	.	.	9	0	0	4	0	0	5	2	0
TOTAL COLIFORM MF	9	1	0	.	.	.	.	.	.	.	.	.
T COLIFORM BCKGRD MF	9	0	0	.	.	.	.	.	.	.	.	.
*TOTAL GROUP BACTERIOLOGICAL	27	1	0	9	0	0	4	0	0	5	2	0
CHEMISTRY (FLD)												
FLD CHLORINE (COMB)	.	.	.	9	9	0	7	6	0	10	2	0
FLD CHLORINE FREE	.	.	.	9	9	0	8	8	0	10	6	0
FLD CHLORINE (TOTAL)	.	.	.	9	9	0	8	8	0	10	6	0
FLD PH	9	9	0	9	9	0	8	8	0	10	10	0
FLD TEMPERATURE	9	9	0	9	9	0	8	8	0	10	10	0
*TOTAL SCAN CHEMISTRY (FLD)	18	18	0	45	45	0	39	38	0	50	34	0
CHEMISTRY (LAB)												
ALKALINITY	9	9	0	9	9	0	8	8	0	10	10	0
CALCIUM	9	9	0	9	9	0	8	8	0	10	10	0
CYANIDE	9	0	0	9	0	1	.	.	.	.	.	.
CHLORIDE	9	9	0	9	9	0	8	8	0	10	10	0
COLOUR	9	8	1	9	9	0	8	8	0	10	10	0
CONDUCTIVITY	9	9	0	9	9	0	8	8	0	10	10	0
DISS ORG CARBON	9	9	0	9	9	0	8	8	0	10	10	0
FLUORIDE	9	9	0	9	9	0	8	8	0	10	10	0
HARDNESS	9	9	0	9	9	0	8	8	0	10	10	0
IONCAL	9	9	0	9	9	0	8	8	0	10	10	0
LANGELIERS INDEX	9	9	0	9	9	0	8	8	0	10	10	0
MAGNESIUM	9	9	0	9	9	0	8	8	0	10	10	0
SODIUM	9	9	0	9	9	0	8	8	0	10	10	0
AMMONIUM TOTAL	9	9	0	9	1	1	8	3	0	10	0	8
NITRITE	9	0	9	9	0	3	8	0	6	10	0	8
TOTAL NITRATES	9	1	6	9	1	7	8	3	2	10	0	9
NITROGEN TOT KJELD	9	9	0	9	9	0	8	8	0	10	10	0
PH	9	9	0	9	9	0	8	8	0	10	10	0
PHOSPHORUS FIL REACT	9	7	2	9	0	8	.	.	.	.	.	.
PHOSPHORUS TOTAL	9	5	4	9	0	8	.	.	.	.	.	.
SULPHATE	9	9	0	9	9	0	8	8	0	10	10	0
TURBIDITY	9	9	0	9	9	0	8	8	0	10	10	0
*TOTAL SCAN CHEMISTRY (LAB)	198	165	22	198	146	28	152	134	8	190	160	25

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM THAMESVILLE WELL SUPPLY
SUMMARY TABLE OF RESULTS (1990)

SCAN PARAMETER	RAW			TREATED			SITE 1			SITE 2		
	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
METALS												
SILVER	9	0	0	9	0	0	8	0	2	10	0	0
ALUMINUM	9	9	0	9	9	0	8	8	0	10	10	0
ARSENIC	9	0	6	9	0	7	8	0	7	10	0	5
BARIUM	9	9	0	9	9	0	8	8	0	10	10	0
BORON	9	9	0	9	9	0	8	8	0	10	10	0
BERYLLIUM	9	0	4	9	0	4	8	0	2	10	0	2
CADMIUM	9	0	0	9	0	0	8	0	4	10	1	9
COBALT	9	0	4	9	0	4	8	0	2	10	0	7
CHROMIUM	9	2	7	9	2	4	8	1	5	10	0	9
COPPER	9	0	1	9	0	0	8	8	0	10	6	4
IRON	9	9	0	9	0	9	8	8	0	10	10	0
MERCURY	9	1	1	9	1	2	.	.	.	.	.	.
MANGANESE	9	9	0	9	9	0	8	8	0	10	10	0
MOLYBDENUM	9	9	0	9	9	0	8	7	1	10	10	0
NICKEL	9	0	0	9	0	0	8	1	1	10	0	1
LEAD	9	0	2	9	0	0	8	8	0	10	10	0
ANTIMONY	9	0	9	9	0	9	8	3	5	10	0	10
SELENIUM	9	0	0	9	0	1	8	0	0	10	0	3
STRONTIUM	9	9	0	9	9	0	8	8	0	10	10	0
TITANIUM	9	9	0	9	9	0	8	8	0	10	10	0
THALLIUM	9	0	0	9	0	0	8	0	0	10	0	0
URANIUM	9	0	8	9	0	7	8	0	6	10	0	8
VANADIUM	9	0	9	9	0	4	8	0	7	10	0	4
ZINC	9	2	7	9	4	5	8	8	0	10	10	0
*TOTAL SCAN METALS	216	77	58	216	70	56	184	92	42	230	107	62
*TOTAL GROUP INORGANIC & PHYSICAL	432	260	80	459	261	84	375	264	50	470	301	87
CHLOROAROMATICS												
HEXACHLOROBUTADIENE	7	0	0	9	0	0	4	0	0	5	0	0
123 TRICHLOROBENZENE	7	0	0	9	0	0	4	0	0	5	0	0
1234 T-CHLOROBENZENE	7	0	0	9	0	0	4	0	0	5	0	0
1235 T-CHLOROBENZENE	7	0	0	9	0	0	4	0	0	5	0	0
124 TRICHLOROBENZENE	7	0	0	9	0	0	4	0	0	5	0	0
1245 T-CHLOROBENZENE	7	0	0	9	0	0	4	0	0	5	0	0
135 TRICHLOROBENZENE	7	0	0	9	0	0	4	0	0	5	0	0
HCB	7	0	0	9	0	0	4	0	0	5	0	0
HEXACHLOROETHANE	7	0	0	9	0	1	4	0	0	5	0	0
OCTACHLOROSTYRENE	7	0	0	9	0	0	4	0	0	5	0	0
PENTACHLOROBENZENE	7	0	0	9	0	0	4	0	0	5	0	0
236 TRICHLOROTOLUENE	7	0	0	9	0	0	4	0	0	5	0	0
245 TRICHLOROTOLUENE	7	0	0	9	0	0	4	0	0	5	0	0
26A TRICHLOROTOLUENE	7	0	0	9	0	0	4	0	0	5	0	0
*TOTAL SCAN CHLOROAROMATICS	98	0	0	126	0	1	56	0	0	70	0	0
CHLOROPHENOLS												

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM THAMESVILLE WELL SUPPLY
SUMMARY TABLE OF RESULTS (1990)

SCAN PARAMETER	RAW			TREATED			SITE 1			SITE 2		
	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
234 TRICHLOROPHENOL	2	0	0	2	0	0	.	.	.	.	.	.
2345 T-CHLOROPHENOL	2	0	0	2	0	0	.	.	.	.	.	.
2356 T-CHLOROPHENOL	2	0	0	2	0	0	.	.	.	.	.	.
245-TRICHLOROPHENOL	2	0	0	2	0	0	.	.	.	.	.	.
246-TRICHLOROPHENOL	2	0	0	2	0	0	.	.	.	.	.	.
PENTACHLOROPHENOL	2	0	0	2	0	0	.	.	.	.	.	.
*TOTAL SCAN CHLOROPHENOLS	12	0	0	12	0	0	0	0	0	0	0	0
PAH												
PHENANTHRENE	9	0	0	9	0	0	.	.	.	1	0	0
ANTHRACENE	8	0	0	8	0	0	.	.	.	1	0	0
FLUORANTHENE	9	0	0	9	0	0	.	.	.	1	0	0
PYRENE	9	0	0	9	0	0	.	.	.	1	0	0
BENZO(A)ANTHRACENE	9	0	0	9	0	0	.	.	.	1	0	0
CHRYSENE	9	0	0	9	0	0	.	.	.	1	0	0
DIMETH. BENZ(A)ANTHR	9	0	0	9	0	0	.	.	.	1	0	0
BENZO(E) PYRENE	9	0	0	9	0	0	.	.	.	1	0	0
BENZO(B) FLUORANTHEN	9	0	0	9	0	0	.	.	.	1	0	0
PERYLENE	9	0	0	9	0	0	.	.	.	1	0	0
BENZO(K) FLUORANTHEN	9	0	0	9	0	0	.	.	.	1	0	0
BENZO(A) PYRENE	9	0	0	9	0	0	.	.	.	1	0	0
BENZO(G,H,I) PERYLEN	9	0	0	9	0	0	.	.	.	1	0	0
DIBENZO(A,H) ANTHRAC	9	0	0	9	0	0	.	.	.	1	0	0
INDENO(1,2,3-C,D) PY	9	0	0	9	0	0	.	.	.	1	0	0
BENZO(B) CHRYSENE	9	0	0	9	0	0	.	.	.	1	0	0
CORONENE	9	0	0	9	0	0	.	.	.	1	0	0
*TOTAL SCAN PAH	152	0	0	152	0	0	0	0	0	17	0	0
PESTICIDES & PCB												
ALDRIN	7	0	0	9	0	0	4	0	0	5	0	0
ALPHA BHC	7	0	0	9	0	0	4	0	0	5	0	0
BETA BHC	7	0	0	9	0	0	4	0	0	5	0	0
LINDANE	7	0	0	9	0	0	4	0	0	5	0	0
ALPHA CHLORDANE	7	0	0	9	0	0	4	0	0	5	0	0
GAMMA CHLORDANE	7	0	0	9	0	0	4	0	0	5	0	0
DIELDRIN	7	0	0	9	0	0	4	0	0	5	0	0
METHOXYCHLOR	7	0	0	9	0	0	4	0	0	5	0	0
ENDOSULFAN 1	7	0	0	9	0	0	4	0	0	5	0	0
ENDOSULFAN II	7	0	0	9	0	0	4	0	0	5	0	0
ENDRIN	7	0	0	9	0	0	4	0	0	5	0	0
ENDOSULFAN SULPHATE	7	0	0	9	0	0	4	0	0	5	0	0
HEPTACHLOR EPOXIDE	7	0	0	9	0	0	4	0	0	5	0	0
HEPTACHLOR	7	0	0	9	0	0	4	0	0	5	0	0
MIREX	7	0	0	9	0	0	4	0	0	5	0	0
OXYCHLORDANE	7	0	0	9	0	0	4	0	0	5	0	0
OPDDT	7	0	0	9	0	0	4	0	0	5	0	0
PCB	7	0	0	9	0	0	4	0	0	5	0	0
DDD	7	0	0	9	0	0	4	0	0	5	0	0
PPDDE	7	0	0	9	0	0	4	0	0	5	0	0

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM THAMESVILLE WELL SUPPLY
SUMMARY TABLE OF RESULTS (1990)

SCAN PARAMETER	RAW			TREATED			SITE 1			SITE 2		
	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
PPDDT	7	0	0	9	0	0	4	0	0	5	0	0
AMETRINE	8	0	0	9	0	0	.	.	.	.	.	.
ATRAZINE	8	0	0	9	0	0	.	.	.	.	.	.
ATRATONE	8	0	0	9	0	0	.	.	.	.	.	.
CYANAZINE (BLADEX)	8	0	0	9	0	0	.	.	.	.	.	.
DESETHYLATRAZINE	8	0	0	9	0	0	.	.	.	.	.	.
D-ETHYL SIMAZINE	8	0	0	9	0	0	.	.	.	.	.	.
PROMETONE	8	0	0	9	0	0	.	.	.	.	.	.
PROPAZINE	8	0	0	9	0	0	.	.	.	.	.	.
PROMETRYNE	8	0	0	9	0	0	.	.	.	.	.	.
METRIBUZIN (SENCOR)	8	0	0	9	0	0	.	.	.	.	.	.
SIMAZINE	8	0	0	9	0	0	.	.	.	.	.	.
ALACHLOR (LASSO)	8	0	0	9	0	0	.	.	.	.	.	.
METOLACHLOR	8	0	0	9	0	0	.	.	.	.	.	.
HEXACLCYCLOPENTADIEN	2	0	0	2	0	0	.	.	.	2	0	0
*TOTAL SCAN PESTICIDES & PCB	253	0	0	308	0	0	84	0	0	107	0	0
PHENOLICS												
PHENOLICS	9	1	3	9	3	2	.	.	.	.	.	.
*TOTAL SCAN PHENOLICS	9	1	3	9	3	2	0	0	0	0	0	0
SPECIFIC PESTICIDES												
TOXAPHENE	7	0	0	9	0	0	4	0	0	5	0	0
2,4,5-T	2	0	0	2	0	0	.	.	.	.	.	.
2,4-D	2	0	0	2	0	0	.	.	.	.	.	.
2,4-DB	2	0	0	2	0	0	.	.	.	.	.	.
2,4 D PROPIONIC ACID	2	0	0	2	0	0	.	.	.	.	.	.
DICAMBA	2	0	0	2	0	0	.	.	.	.	.	.
PICHLORAM	1	0	0	0	0	0	.	.	.	.	.	.
SILVEX	2	0	0	2	0	0	.	.	.	.	.	.
DIAZINON	1	0	0	2	0	0	.	.	.	.	.	.
DICHLOROVOS	1	0	0	2	0	0	.	.	.	.	.	.
CHLORPYRIFOS	1	0	0	2	0	0	.	.	.	.	.	.
ETHION	1	0	0	2	0	0	.	.	.	.	.	.
AZINPHOS-METHYL	0	0	0	0	0	0	.	.	.	.	.	.
MALATHION	1	0	0	2	0	0	.	.	.	.	.	.
MEVINPHOS	1	0	0	2	0	0	.	.	.	.	.	.
METHYL PARATHION	1	0	0	2	0	0	.	.	.	.	.	.
METHYLTRITHION	1	0	0	2	0	0	.	.	.	.	.	.
PARATHION	1	0	0	2	0	0	.	.	.	.	.	.
PHORATE	1	0	0	1	0	0	.	.	.	.	.	.
RELDAN	1	0	0	2	0	0	.	.	.	.	.	.
RONNEL	1	0	0	2	0	0	.	.	.	.	.	.
AMINOCARB	0	0	0	0	0	0	.	.	.	.	.	.
BENOMYL	0	0	0	0	0	0	.	.	.	.	.	.
BUX	0	0	0	0	0	0	.	.	.	.	.	.
CARBOFURAN	2	0	0	2	0	0	.	.	.	.	.	.
CICP	2	0	0	2	0	0	.	.	.	.	.	.
DIALLATE	2	0	0	2	0	0	.	.	.	.	.	.

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM THAMESVILLE WELL SUPPLY
SUMMARY TABLE OF RESULTS (1990)

SCAN PARAMETER	RAW			TREATED			SITE 1			SITE 2		
	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
EPTAM	2	0	0	2	0	0	.	.	.	.	.	.
IPC	2	0	0	2	0	0	.	.	.	.	.	.
PROPOXUR	2	0	0	2	0	0	.	.	.	.	.	.
CARBARYL	2	0	0	2	0	0	.	.	.	.	.	.
BUTYLATE	2	0	0	2	0	0	.	.	.	.	.	.
*TOTAL SCAN SPECIFIC PESTICIDES	48	0	0	60	0	0	4	0	0	5	0	0
VOLATILES												
BENZENE	9	0	1	9	0	0	4	0	1	5	0	2
TOLUENE	9	0	0	9	0	0	4	0	0	5	0	0
ETHYLBENZENE	9	0	7	9	0	5	4	0	2	5	0	3
P-XYLENE	9	0	0	9	0	0	4	0	0	5	0	0
M-XYLENE	9	0	0	9	0	0	4	0	0	5	0	2
O-XYLENE	9	0	0	9	0	0	4	0	0	5	0	4
STYRENE	9	0	7	9	0	0	4	0	1	5	0	4
1,1 DICHLOROETHYLENE	9	0	0	9	0	0	4	0	0	5	0	0
METHYLENE CHLORIDE	9	0	0	9	0	0	4	0	0	5	0	0
T1,2DICHLOROETHYLENE	9	0	0	9	0	0	4	0	0	5	0	0
1,1 DICHLOROETHANE	9	0	0	9	0	0	4	0	0	5	0	0
CHLOROFORM	9	0	0	9	9	0	4	4	0	5	5	0
111, TRICHLOROETHANE	9	0	0	9	0	0	4	0	0	5	0	0
1,2 DICHLOROETHANE	9	0	0	9	0	0	4	0	0	5	0	0
CARBON TETRACHLORIDE	9	0	0	9	0	0	4	0	0	5	0	0
1,2 DICHLOROPROPANE	9	0	0	9	0	0	4	0	0	5	0	0
TRICHLOROETHYLENE	9	0	0	9	0	0	4	0	0	5	0	0
DICHLOROBROMOMETHANE	9	0	0	9	9	0	4	4	0	5	5	0
112 TRICHLOROETHANE	9	0	0	9	0	0	4	0	0	5	0	0
CHLORODIBROMOMETHANE	9	0	0	9	9	0	4	4	0	5	5	0
T-CHLOROETHYLENE	9	0	0	9	0	0	4	0	0	5	0	0
BROMOFORM	9	0	0	9	0	0	4	0	0	5	0	0
1122 T-CHLOROETHANE	9	0	0	9	0	0	4	0	0	5	0	0
CHLOROBENZENE	9	0	0	9	0	0	4	0	0	5	0	0
1,4 DICHLOROBENZENE	9	0	0	9	0	0	4	0	0	5	0	0
1,3 DICHLOROBENZENE	9	0	0	9	0	0	4	0	0	5	0	0
1,2 DICHLOROBENZENE	9	0	0	9	0	0	4	0	0	5	0	0
ETHLYENE DIBROMIDE	9	0	0	9	0	0	4	0	0	5	0	0
TOTL TRIHALOMETHANES	9	0	0	9	9	0	4	4	0	5	5	0
*TOTAL SCAN VOLATILES	261	0	15	261	36	5	116	16	4	145	20	15
*TOTAL GROUP ORGANIC	833	1	18	928	39	8	260	16	4	344	20	15

KEY TO TABLE 5 and 6

A ONTARIO DRINKING WATER OBJECTIVES (ODWO)
1. Maximum Acceptable Concentration (MAC)
1+. MAC for Total Trihalomethanes
2. Interim Maximum Acceptable Concentration (IMAC)
3. Aesthetic Objective (AO)
3*. AO for Total Xylenes
4. Recommended Operational Guideline

B HEALTH & WELFARE CANADA (H&W)
1. Maximum Acceptable Concentration (MAC)
2. Proposed MAC
3. Interim MAC
4. Aesthetic Objective (AO)

C WORLD HEALTH ORGANIZATION (WHO)
1. Guideline Value (GV)
2. Tentative GV
3. Aesthetic GV

D US ENVIRONMENTAL PROTECTION AGENCY (EPA)
1. Maximum Contaminant Level (MCL)
2. Suggested No-Adverse Effect Level (SNAEL)
3. Lifetime Health Advisory
4. EPA Ambient Water Quality Criteria
4T. EPA Ambient Water Quality Criteria for Total PAH

F EUROPEAN ECONOMIC COMMUNITY (EEC)
1. Health Related Guideline Level
2. Aesthetic Guideline Level
3. Maximum Admissable Concentration (MADC)

G CALIFORNIA STATE DEPARTMENT OF HEALTH-GUIDELINE VALUE

I NEW YORK STATE AMBIENT WATER GUIDELINE

N/A NONE AVAILABLE

LABORATORY RESULTS, REMARK DESCRIPTIONS

.	No Sample Taken
BDL	Below Minimum Measurement Amount
<T	Greater Than Detection Limit But Not Confident (SEE INTERPRETATION OF RESULTS ABOVE)
>	Results Are Greater Than The Upper Limit
<=>	Approximate Result
!CS	No Data: Contamination Suspected
!IL	No Data: Sample Incorrectly Labelled
!IS	No Data: Insufficient Sample
!IV	No Data: Inverted Septum
!LA	No Data: Laboratory Accident
!LD	No Data: Test Queued After Sample Discarded
!NA	No Data: No Authorization To Perform Reanalysis
!NP	No Data: No Procedure
!NR	No Data: Sample Not Received
!OP	No Data: Obscured Plate
!QU	No Data: Quality Control Unacceptable
!PE	No Data: Procedural Error - Sample Discarded
!PH	No Data: Sample pH Outside Valid Range
!RE	No Data: Received Empty
!RO	No Data: See Attached Report (no numeric results)
!SM	No Data: Sample Missing
!SS	No Data: Send Separate Sample Properly Preserved
!UI	No Data: Indeterminant Interference
!TX	No Data: Time Expired
A3C	Approximate, Total Count Exceeded 300 Colonies
APL	Additional Peak, Large, Not Priority Pollutant
APS	Additional Peak, Less Than, Not Priority Pollutant
CIC	Possible Contamination, Improper Cap
CRO	Calculated Result Only
PPS	Test Performed On Preserved Sample
RMP	P and M-Xylene Not Separated
RRV	Rerun Verification
RVU	Reported Value Unusual
SPS	Several Peaks, Small, Not Priority Pollutant

UCR		Unreliable: Could Not Confirm By Reanalysis
UCS		Unreliable: Contamination Suspected
UIN		Unreliable: Indeterminate Interference
XP		Positive After X Number Of Hours
T#	(T06)	Result Taken After # Hours

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM THAMESVILLE WELL SUPPLY 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
BACTERIOLOGICAL						
FECAL COLIFORM MF (CT/100ML)			**DET'N LIMIT = 0**	**GUIDELINE = 0 (A1)**		
JAN	0	.	.	.	.	.
FEB	0	.	.	.	.	.
MAR	0	.	.	.	.	.
MAY	BDL	.	.	.	.	.
JUN	BDL	.	.	.	.	.
JUL	BDL	.	.	.	.	.
AUG	BDL	.	.	.	.	.
OCT	BDL	.	.	.	.	.
DEC	BDL	.	.	.	.	.
STANDRD PLATE CNT MF (COUNTS/ML)			**DET'N LIMIT = 0**	**GUIDELINE = 500/ML (A3)**		
JAN	.	1 <=>	.	0 <=>	.	.
FEB	.	3 <=>	.	6 <=>	.	.
MAR	.	0 <=>	.	0 <=>	.	.
MAY	.	0 <=>	.	1 <=>	.	.
JUN	.	2 <=>	.	.	.	15
JUL	.	1 <=>	.	.	.	0 <=>
AUG	.	1 <=>	.	.	.	2400 >
OCT	.	1 <=>	.	.	.	2 <=>
DEC	.	0 <=>	.	.	.	0 <=>
TOTAL COLIFORM MF (CT/100ML)			**DET'N LIMIT = 0**	**GUIDELINE = 5/100ML(A1)**		
JAN	0	.	.	.	.	.
FEB	1	.	.	.	.	.
MAR	0	.	.	.	.	.
MAY	BDL	.	.	.	.	.
JUN	BDL	.	.	.	.	.
JUL	BDL	.	.	.	.	.
AUG	BDL	.	.	.	.	.
OCT	BDL	.	.	.	.	.
DEC	BDL	.	.	.	.	.
T COLIFORM BCKGRD MF (CT/100ML)			**DET'N LIMIT = 0**	**GUIDELINE = N/A**		
JAN	0	.	.	.	.	.
FEB	0	.	.	.	.	.
MAR	0	.	.	.	.	.
MAY	BDL	.	.	.	.	.
JUN	BDL	.	.	.	.	.
JUL	BDL	.	.	.	.	.
AUG	BDL	.	.	.	.	.
OCT	BDL	.	.	.	.	.
DEC	BDL	.	.	.	.	.

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM THAMESVILLE WELL SUPPLY 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
CHEMISTRY (FLD)						
FLD CHLORINE (COMB) (MG/L)			DET'N LIMIT = 0		GUIDELINE = N/A	
JAN	.	.800	.800	1.200	.	.
FEB	.	.800	.	.200	.	.
MAR	.	.700	.200	.200	.	.
MAY	.	.400	.000	.200	.	.
JUN	.	.600	.	.	.000	.000
JUL	.	.800	.	.	.000	.900
AUG	.	.400	.	.	.000	.000
OCT	.	.400	.	.	.000	.000
DEC	.	.200	.	.	.000	.200
FLD CHLORINE FREE (MG/L)			DET'N LIMIT = 0		GUIDELINE = N/A	
JAN	.	2.400	.300	1.100	.	.
FEB	.	2.200	.700	.900	.	.
MAR	.	2.900	.900	.900	.	.
MAY	.	2.800	.500	.700	.	.
JUN	.	2.800	.	.	.000	.300
JUL	.	2.200	.	.	.100	.900
AUG	.	2.600	.	.	.000	.000
OCT	.	2.600	.	.	.000	.300
DEC	.	2.800	.	.	.300	.300
FLD CHLORINE (TOTAL) (MG/L)			DET'N LIMIT = 0		GUIDELINE = N/A	
JAN	.	3.200	1.100	2.300	.	.
FEB	.	3.000	.700	1.100	.	.
MAR	.	3.600	1.100	1.100	.	.
MAY	.	3.200	.500	.900	.	.
JUN	.	3.400	.	.	.000	.300
JUL	.	3.000	.	.	.100	1.800
AUG	.	3.000	.	.	.000	.000
OCT	.	3.000	.	.	.000	.300
DEC	.	3.000	.	.	.300	.500
FLD PH (DMNSLESS)			DET'N LIMIT = N/A		GUIDELINE = 6.5-8.5(A4)	
JAN	7.400	7.400	7.200	7.200	.	.
FEB	7.400	7.400	7.400	7.400	.	.
MAR	7.400	7.400	7.400	7.400	.	.
MAY	7.400	7.400	7.400	7.400	.	.
JUN	7.400	7.400	.	.	7.400	7.400
JUL	7.400	7.400	.	.	7.400	7.400
AUG	7.400	7.400	.	.	7.400	7.400
OCT	7.400	7.400	.	.	7.400	7.400
DEC	7.400	7.400	.	.	7.400	7.400
FLD TEMPERATURE (DEG.C)			DET'N LIMIT = N/A		GUIDELINE = 15 (A3)	
JAN	11.000	11.000	8.000	7.000	.	.
FEB	11.000	11.000	7.000	7.000	.	.
MAR	11.000	11.000	10.000	9.000	.	.
MAY	11.000	11.000	14.000	13.000	.	.
JUN	11.000	11.000	.	.	18.000	17.000
JUL	11.000	11.000	.	.	20.000	18.000
AUG	11.000	11.000	.	.	21.000	19.000
OCT	11.000	11.000	.	.	16.500	16.000
DEC	11.000	11.000	.	.	11.500	10.000

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM THAMESVILLE WELL SUPPLY 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
CHEMISTRY (LAB)						
ALKALINITY (MG/L)			DET'N LIMIT = 0.2		GUIDELINE = 30-500 (A4)	
JAN	273.500	267.400	266.700	265.800	.	.
FEB	277.200	276.600	273.100	270.800	.	.
MAR	286.800	278.500	284.700	278.000	.	.
MAY	274.600	271.000	271.400	271.000	.	.
JUN	274.600	267.600	.	.	273.400	270.000
JUL	270.500	264.500	.	.	267.800	264.000
AUG	269.400	265.600	.	.	266.100	267.000
OCT	274.600	270.300	.	.	270.100	268.400
DEC	274.300	271.400	.	.	272.800	275.900
CALCIUM (MG/L)			DET'N LIMIT = 0.2		GUIDELINE = 100 (F2)	
JAN	104.100	103.600	101.400	102.600	.	.
FEB	111.800	110.100	113.900	110.100	.	.
MAR	129.000	126.000	130.000	130.000	.	.
MAY	100.300	101.300	102.000	99.300	.	.
JUN	100.000	97.200	.	.	100.000	97.300
JUL	99.600	98.300	.	.	98.800	97.600
AUG	96.300	98.900	.	.	96.500	97.400
OCT	120.000	121.000	.	.	114.000	115.000
DEC	102.000	102.000	.	.	107.000	106.000
CYANIDE (MG/L)			DET'N LIMIT = 0.001		GUIDELINE = .2 (A1)	
JAN	BDL	BDL	.	.	.	.
FEB	BDL	.002 <T	.	.	.	.
MAR	BDL	BDL	.	.	.	.
MAY	BDL	BDL	.	.	.	.
JUN	BDL	BDL	.	.	.	.
JUL	BDL	BDL	.	.	.	.
AUG	BDL	BDL	.	.	.	.
OCT	BDL	BDL	.	.	.	.
DEC	BDL	BDL	.	.	.	.
CHLORIDE (MG/L)			DET'N LIMIT = 0.2		GUIDELINE = 250 (A3)	
JAN	16.800	20.200	20.100	19.900	.	.
FEB	18.500	22.400	22.400	21.800	.	.
MAR	24.600	28.000	29.000	28.200	.	.
MAY	15.500	19.600	19.600	19.100	.	.
JUN	14.900	16.300	.	.	18.100	17.800
JUL	14.900	18.700	.	.	18.600	18.300
AUG	13.400	16.300	.	.	17.000	17.100
OCT	23.500	27.100	.	.	23.600	24.700
DEC	15.700	19.700	.	.	20.700	20.400
COLOUR (HZU)			DET'N LIMIT = 0.5		GUIDELINE = 5 (A3)	
JAN	14.000	2.500	11.000	4.500	.	.
FEB	29.500	5.000	23.000	4.000	.	.
MAR	15.000	3.000	10.000	4.000	.	.
MAY	22.500	4.500	4.500	5.000	.	.
JUN	16.500	5.000	.	.	6.000	5.000
JUL	18.500	2.500	.	.	5.000	5.000
AUG	18.000	3.500	.	.	6.000	5.500
OCT	6.500	2.500	.	.	5.000	4.500
DEC	2.000 <T	2.500	.	.	3.500	4.000

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM THAMESVILLE WELL SUPPLY 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
CONDUCTIVITY (UMHO/CM)			DET'N LIMIT = 1.	GUIDELINE = 400 (F2)		
JAN	635	638	621	624	.	.
FEB	663	665	661	658	.	.
MAR	738	741	766	751	.	.
MAY	614	620	622	616	.	.
JUN	582	578	.	.	589	588
JUL	594	599	.	.	600	594
AUG	569	571	.	.	572	575
OCT	717	721	.	.	674	687
DEC	609	620	.	.	628	630
DISS ORG CARBON (MG/L)			DET'N LIMIT = .100	GUIDELINE = 5.0 (A3)		
JAN	3.100	2.900	3.100	3.000	.	.
FEB	3.000	2.600	2.700	2.500	.	.
MAR	2.900	2.600	3.000	2.600	.	.
MAY	3.400	3.000	2.900	3.000	.	.
JUN	3.400	2.900	.	.	2.900	2.800
JUL	3.300	2.900	.	.	2.700	2.800
AUG	3.200	2.800	.	.	2.800	2.700
OCT	2.100	2.000	.	.	4.200	5.400
DEC	2.900	2.800	.	.	2.900	2.800
FLUORIDE (MG/L)			DET'N LIMIT = 0.01	GUIDELINE = 2.4 (A1)		
JAN	.280	.300	.300	.300	.	.
FEB	.280	.280	.280	.280	.	.
MAR	.260	.260	.260	.260	.	.
MAY	.320	.320	.320	.300	.	.
JUN	.300	.300	.	.	.320	.300
JUL	.280	.300	.	.	.280	.300
AUG	.320	.320	.	.	.300	.320
OCT	.260	.260	.	.	.280	.260
DEC	.300	.280	.	.	.280	.280
HARDNESS (MG/L)			DET'N LIMIT = 0.5	GUIDELINE = 80-100 (A4)		
JAN	322.100	321.000	313.900	317.000	.	.
FEB	344.700	341.100	349.100	340.600	.	.
MAR	399.000	391.000	403.000	403.000	.	.
MAY	310.200	314.100	314.100	306.400	.	.
JUN	306.900	300.700	.	.	306.200	300.200
JUL	305.700	302.500	.	.	303.700	300.400
AUG	297.000	302.700	.	.	297.200	296.600
OCT	372.000	375.000	.	.	353.000	356.000
DEC	315.000	317.000	.	.	329.000	326.000
IONCAL (DMNSLESS)			DET'N LIMIT = N/A	GUIDELINE = N/A		
JAN	.557	.610	.350	1.027	.	.
FEB	.165	2.194	1.564	.559	.	.
MAR	2.597	.858	.015	2.584	.	.
MAY	1.535	1.089	.924	2.143	.	.
JUN	2.277	1.739	.	.	.676	.483
JUL	2.291	1.611	.	.	.869	1.415
AUG	4.027	5.867	.	.	3.478	2.917
OCT	1.609	1.535	.	.	2.019	.947
DEC	.497	.948	.	.	3.055	1.428

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM THAMESVILLE WELL SUPPLY 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
LANGELIERS INDEX (DMNSLESS)			DET'N LIMIT = N/A	GUIDELINE = N/A		
JAN	1.081	1.029	1.150	1.053	.	.
FEB	1.117	1.129	1.249	1.130	.	.
MAR	1.400	1.357	1.489	1.359	.	.
MAY	1.198	1.186	1.220	1.148	.	.
JUN	1.390	1.357	.	.	1.457	1.390
JUL	1.060	.964	.	.	1.092	1.011
AUG	1.046	1.042	.	.	1.212	1.137
OCT	1.281	1.237	.	.	1.333	1.294
DEC	.815	1.020	.	.	1.103	.993
MAGNESIUM (MG/L)			DET'N LIMIT = 0.10	GUIDELINE = 30 (F2)		
JAN	15.100	15.150	14.750	14.800	.	.
FEB	15.950	16.100	15.750	15.950	.	.
MAR	18.500	18.300	19.100	19.000	.	.
MAY	14.550	14.850	14.400	14.200	.	.
JUN	13.950	14.100	.	.	13.750	13.900
JUL	13.850	13.850	.	.	13.900	13.800
AUG	13.750	13.500	.	.	13.650	13.000
OCT	17.800	17.700	.	.	16.300	16.600
DEC	14.900	15.000	.	.	15.100	14.800
SODIUM (MG/L)			DET'N LIMIT = 0.2	GUIDELINE = 200 (A4)		
JAN	13.100	13.400	13.700	13.700	.	.
FEB	11.200	11.200	11.500	11.400	.	.
MAR	13.000	13.000	13.000	13.200	.	.
MAY	12.600	12.900	13.100	12.800	.	.
JUN	12.700	12.700	.	.	12.900	13.400
JUL	13.700	13.900	.	.	13.700	13.700
AUG	13.800	14.000	.	.	14.200	13.900
OCT	13.500	13.500	.	.	13.400	13.200
DEC	11.400	13.200	.	.	13.400	13.400
AMMONIUM TOTAL (MG/L)			DET'N LIMIT = 0.002	GUIDELINE = 0.05 (F2)		
JAN	.168	BDL	.146	BDL	.	.
FEB	.176	BDL	.138	BDL	.	.
MAR	.180	BDL	.244	BDL	.	.
MAY	.158	BDL	BDL	BDL	.	.
JUN	.142	.018	.	.	.006 <T	.002 <T
JUL	.154	BDL	.	.	BDL	BDL
AUG	.164	.004 <T	.	.	.004 <T	.002 <T
OCT	.180	BDL	.	.	.004 <T	.008 <T
DEC	.146	BDL	.	.	.002 <T	.002 <T
NITRITE (MG/L)			DET'N LIMIT = 0.001	GUIDELINE = 1 (A1)		
JAN	.001 <T	BDL	.003 <T	.001 <T	.	.
FEB	.003 <T	BDL	.003 <T	BDL	.	.
MAR	.003 <T	BDL	.002 <T	BDL	.	.
MAY	.004 <T	BDL	.002 <T	.002 <T	.	.
JUN	.003 <T	.001 <T	.	.	.003 <T	.004 <T
JUL	.001 <T	.001 <T	.	.	.001 <T	.001 <T
AUG	.002 <T	.001 <T	.	.	.001 <T	.001 <T
OCT	.003 <T	BDL	.	.	.001 <T	.001 <T
DEC	.001 <T	BDL	.	.	BDL	BDL

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM THAMESVILLE WELL SUPPLY 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
TOTAL NITRATES (MG/L)			DET'N LIMIT = 0.005	GUIDELINE = 10 (A1)		
JAN	.005 <T	.010 <T	.455	.010 <T	.	.
FEB	.015 <T	.015 <T	.235	.010 <T	.	.
MAR	.025	.025	.455	BDL	.	.
MAY	BDL	BDL	BDL	BDL	.	.
JUN	BDL	.005 <T	.	.	.005 <T	BDL
JUL	.005 <T	.010 <T	.	.	.005 <T	.005
AUG	.010 <T	.005 <T	.	.	.005 <T	.005
OCT	.010 <T	.015 <T	.	.	.005 <T	.015
DEC	.005 <T	.005 <T	.	.	.010 <T	.010
NITROGEN TOT KJELD (MG/L)			DET'N LIMIT = 0.02	GUIDELINE = N/A		
JAN	.320	.130	.320	.140	.	.
FEB	.360	.170	.310	.190	.	.
MAR	.370	.140	.450	.150	.	.
MAY	.160	.120	.580	.580	.	.
JUN	.340	.160	.	.	.170	.150
JUL	.360	.140	.	.	.140	.130
AUG	.330	.120	.	.	.150	.140
OCT	.325	.120	.	.	.160	.140
DEC	.330	.150	.	.	.150	.150
PH (DMNSLESS)			DET'N LIMIT = N/A	GUIDELINE = 6.5-8.5(A4)		
JAN	8.100	8.060	8.190	8.090	.	.
FEB	8.100	8.120	8.230	8.130	.	.
MAR	8.310	8.290	8.400	8.280	.	.
MAY	8.230	8.220	8.250	8.190	.	.
JUN	8.420	8.410	.	.	8.490	8.440
JUL	8.100	8.020	.	.	8.140	8.070
AUG	8.100	8.090	.	.	8.270	8.190
OCT	8.240	8.200	.	.	8.320	8.280
DEC	7.840	8.050	.	.	8.110	8.000
PHOSPHORUS FIL REACT (MG/L)			DET'N LIMIT = 0.005	GUIDELINE = N/A		
JAN	.006	.001 <T	.	.	.	.
FEB	.009	.002 <T	.	.	.	.
MAR	.009	.001 <T	.	.	.	.
MAY	.005	.001 <T	.	.	.	.
JUN	.002 <T	.001 <T	.	.	.	.
JUL	.005	BDL	.	.	.	.
AUG	.008	.002 <T	.	.	.	.
OCT	.008	.001 <T	.	.	.	.
DEC	.001 <T	.001 <T	.	.	.	.
PHOSPHORUS TOTAL (MG/L)			DET'N LIMIT = 0.002	GUIDELINE = .40 (F2)		
JAN	.012	.004 <T	.	.	.	.
FEB	.011	.003 <T	.	.	.	.
MAR	.016	.005 <T	.	.	.	.
MAY	.005 <T	.004 <T	.	.	.	.
JUN	.009 <T	BDL	.	.	.	.
JUL	.009 <T	.002 <T	.	.	.	.
AUG	.012	.003 <T	.	.	.	.
OCT	.018	.004 <T	.	.	.	.
DEC	.006 <T	.004 <T	.	.	.	.

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM THAMESVILLE WELL SUPPLY 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
SULPHATE (MG/L)			DET'N LIMIT = .200	GUIDELINE = 500 (A3)		
JAN	53.670	54.130	46.770	47.480	.	.
FEB	63.190	62.680	60.850	59.250	.	.
MAR	90.920	92.650	100.910	98.700	.	.
MAY	45.120	45.280	44.670	41.690	.	.
JUN	30.800	30.840	.	.	31.750	31.240
JUL	35.500	35.040	.	.	35.290	34.420
AUG	25.560	24.870	.	.	25.800	25.460
OCT	85.150	86.030	.	.	67.100	74.170
DEC	41.470	40.980	.	.	43.970	43.240
TURBIDITY (FTU)			DET'N LIMIT = 0.05	GUIDELINE = 1 (A1)		
JAN	4.300	.490	13.700	.860	.	.
FEB	9.900	.660	8.100	.710	.	.
MAR	14.200	.600	8.000	.660	.	.
MAY	8.300	.870	.940	.480	.	.
JUN	4.400	.480	.	.	1.100	.600
JUL	6.100	.260	.	.	.950	.650
AUG	5.100	.450	.	.	1.410	1.250
OCT	10.000	.350	.	.	.740	.430
DEC	6.000	.930	.	.	1.780	.620

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM THAMESVILLE WELL SUPPLY 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
METALS						
SILVER (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 50 (A1)		
JAN	BDL	BDL	BDL	BDL	.	.
FEB	BDL	BDL	.120 <T	BDL	.	.
MAR	BDL	BDL	.080 <T	BDL	.	.
MAY	BDL	BDL	BDL	BDL	.	.
JUN	BDL	BDL	.	.	BDL	BDL
JUL	BDL	BDL	.	.	BDL	BDL
AUG	BDL	BDL	.	.	BDL	BDL
OCT	BDL	BDL	.	.	BDL	BDL
DEC	BDL	BDL	.	.	BDL	BDL
ALUMINUM (UG/L)			DET'N LIMIT = 0.10	GUIDELINE = 100 (A4)		
JAN	5.800	5.700	16.000	6.000	.	.
FEB	7.900	7.700	10.000	7.500	.	.
MAR	6.300	6.000	7.600	5.600	.	.
MAY	30.000	30.000	30.000	28.000	.	.
JUN	4.000	3.500	.	.	5.500	3.400
JUL	5.900	5.800	.	.	7.500	6.000
AUG	12.000	11.000	.	.	12.000	11.000
OCT	2.300	2.000	.	.	8.400	2.900
DEC	2.900	3.200	.	.	10.000	2.800
ARSENIC (UG/L)			DET'N LIMIT = 0.10	GUIDELINE = 25 (A1)		
JAN	.260 <T	.300 <T	.330 <T	.240 <T	.	.
FEB	.420 <T	.560 <T	.430 <T	.450 <T	.	.
MAR	.390 <T	.250 <T	.410 <T	.290 <T	.	.
MAY	.220 <T	.320 <T	.210 <T	BDL	.	.
JUN	.110 <T	BDL	.	.	BDL	BDL
JUL	BDL	.220 <T	.	.	.220 <T	.200 <T
AUG	BDL	.140 <T	.	.	.270 <T	BDL
OCT	.510 <T	.370 <T	.	.	.350 <T	.270 <T
DEC	BDL	BDL	.	.	BDL	BDL
BARIUM (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 1000 (A2)		
JAN	230.000	180.000	180.000	170.000	.	.
FEB	250.000	210.000	200.000	200.000	.	.
MAR	280.000	230.000	240.000	230.000	.	.
MAY	220.000	180.000	170.000	170.000	.	.
JUN	210.000	160.000	.	.	170.000	160.000
JUL	220.000	170.000	.	.	170.000	170.000
AUG	200.000	150.000	.	.	160.000	150.000
OCT	260.000	200.000	.	.	180.000	190.000
DEC	210.000	170.000	.	.	170.000	170.000
BORON (UG/L)			DET'N LIMIT = 2.00	GUIDELINE = 5000 (A1)		
JAN	99.000	97.000	96.000	95.000	.	.
FEB	120.000	130.000	90.000	93.000	.	.
MAR	98.000	96.000	100.000	93.000	.	.
MAY	130.000	180.000	110.000	120.000	.	.
JUN	110.000	110.000	.	.	110.000	110.000
JUL	97.000	94.000	.	.	98.000	91.000
AUG	140.000	140.000	.	.	140.000	130.000
OCT	94.000	89.000	.	.	89.000	90.000
DEC	99.000	90.000	.	.	87.000	97.000

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM THAMESVILLE WELL SUPPLY 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
BERYLLIUM (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 6800 (D4)		
JAN	BDL	BDL	BDL	BDL	.	.
FEB	.090 <T	.110 <T	BDL	BDL	.	.
MAR	.080 <T	.090 <T	.070 <T	.060 <T	.	.
MAY	BDL	.140 <T	BDL	BDL	.	.
JUN	.070 <T	BDL	.	.	BDL	BDL
JUL	BDL	BDL	.	.	BDL	BDL
AUG	.170 <T	.170 <T	.	.	.110 <T	.070 <T
OCT	BDL	BDL	.	.	BDL	BDL
DEC	BDL	BDL	.	.	BDL	BDL
CADMIUM (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 5 (A1)		
JAN	BDL	BDL	.220 <T	BDL	.	.
FEB	BDL	BDL	.190 <T	BDL	.	.
MAR	BDL	BDL	.290 <T	BDL	.	.
MAY	BDL	BDL	.400 <T	BDL	.	.
JUN	BDL	BDL	.	.	.840	.240 <T
JUL	BDL	BDL	.	.	.360 <T	.080 <T
AUG	BDL	BDL	.	.	.270 <T	.070 <T
OCT	BDL	BDL	.	.	.200 <T	.100 <T
DEC	BDL	BDL	.	.	.340 <T	.060 <T
COBALT (UG/L)			DET'N LIMIT = 0.02	GUIDELINE = N/A		
JAN	BDL	BDL	BDL	BDL	.	.
FEB	BDL	BDL	BDL	BDL	.	.
MAR	BDL	BDL	BDL	BDL	.	.
MAY	.090 <T	.240 <T	.230 <T	.200 <T	.	.
JUN	.180 <T	.230 <T	.	.	.200 <T	.200 <T
JUL	BDL	BDL	.	.	BDL	BDL
AUG	BDL	BDL	.	.	.030 <T	BDL
OCT	.250 <T	.270 <T	.	.	.250 <T	.280 <T
DEC	.030 <T	.100 <T	.	.	.120 <T	.080 <T
CHROMIUM (UG/L)			DET'N LIMIT = 0.50	GUIDELINE = 50 (A1)		
JAN	1.300 <T	BDL	.850 <T	BDL	.	.
FEB	5.200	6.500	1.200 <T	BDL	.	.
MAR	5.700	5.300	5.900	4.900 <T	.	.
MAY	1.600 <T	4.700 <T	1.400 <T	1.100 <T	.	.
JUN	4.800 <T	4.100 <T	.	.	4.800 <T	3.400 <T
JUL	1.200 <T	BDL	.	.	2.100 <T	.710 <T
AUG	3.900 <T	3.300 <T	.	.	4.200 <T	3.100 <T
OCT	3.600 <T	1.300 <T	.	.	.560 <T	.670 <T
DEC	3.700 <T	BDL	.	.	BDL	3.400 <T
COPPER (UG/L)			DET'N LIMIT = 0.50	GUIDELINE = 1000 (A3)		
JAN	BDL	BDL	250.000	12.000	.	.
FEB	BDL	BDL	120.000	7.500	.	.
MAR	BDL	BDL	120.000	7.900	.	.
MAY	BDL	BDL	9.500	6.100	.	.
JUN	BDL	BDL	.	.	6.000	2.600 <T
JUL	BDL	BDL	.	.	9.600	8.500
AUG	BDL	BDL	.	.	7.300	1.300 <T
OCT	.650 <T	BDL	.	.	4.200 <T	4.600 <T
DEC	BDL	BDL	.	.	19.000	5.100

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM THAMESVILLE WELL SUPPLY 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
IRON (UG/L)			DET'N LIMIT = 6.00	GUIDELINE = 300 (A3)		
JAN	990.000	41.000 <T	2500.000	150.000	.	.
FEB	800.000	40.000 <T	1100.000	89.000	.	.
MAR	1100.000	39.000 <T	920.000	150.000	.	.
MAY	840.000	54.000 <T	84.000	99.000	.	.
JUN	900.000	26.000 <T	.	.	220.000	180.000
JUL	970.000	33.000 <T	.	.	180.000	160.000
AUG	830.000	37.000 <T	.	.	200.000	160.000
OCT	1000.000	44.000 <T	.	.	200.000	120.000
DEC	870.000	42.000 <T	.	.	160.000	120.000
MERCURY (UG/L)			DET'N LIMIT = 0.02	GUIDELINE = 1 (A1)		
JAN	.090	.110	.	.	.	.
FEB	.100 <T	.090 <T	.	.	.	.
MAR	BDL	BDL	.	.	.	.
MAY	BDL	BDL	.	.	.	.
JUN	BDL	BDL	.	.	.	.
JUL	BDL	.030 <T	.	.	.	.
AUG	BDL	BDL	.	.	.	.
OCT	BDL	BDL	.	.	.	.
DEC	BDL	BDL	.	.	.	.
MANGANESE (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 50 (A3)		
JAN	160.000	12.000	130.000	16.000	.	.
FEB	170.000	29.000	53.000	8.200	.	.
MAR	190.000	15.000	39.000	11.000	.	.
MAY	140.000	37.000	60.000	8.600	.	.
JUN	140.000	9.600	.	.	19.000	7.200
JUL	140.000	10.000	.	.	7.400	5.300
AUG	130.000	10.000	.	.	6.900	5.400
OCT	170.000	9.400	.	.	9.100	6.300
DEC	140.000	12.000	.	.	6.100	3.500
MOLYBDENUM (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = N/A		
JAN	1.300	.980	.370 <T	.840	.	.
FEB	1.500	1.200	.600	1.100	.	.
MAR	3.100	1.900	1.200	1.800	.	.
MAY	1.200	.940	1.000	1.100	.	.
JUN	.850	.740	.	.	.910	.860
JUL	1.200	.920	.	.	1.000	.950
AUG	.890	.820	.	.	.900	.920
OCT	3.900	2.600	.	.	1.800	2.000
DEC	1.200	1.100	.	.	1.200	1.100
NICKEL (UG/L)			DET'N LIMIT = 0.20	GUIDELINE = 350 (D3)		
JAN	BDL	BDL	3.500	BDL	.	.
FEB	BDL	BDL	BDL	BDL	.	.
MAR	BDL	BDL	BDL	BDL	.	.
MAY	BDL	BDL	.900 <T	BDL	.	.
JUN	BDL	BDL	.	.	.420 <T	BDL
JUL	BDL	BDL	.	.	BDL	BDL
AUG	BDL	BDL	.	.	BDL	BDL
OCT	BDL	BDL	.	.	BDL	BDL
DEC	BDL	BDL	.	.	BDL	BDL

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM THAMESVILLE WELL SUPPLY 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
LEAD (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 10. (A1)		
JAN	BDL	BDL	120.000	4.300	.	.
FEB	.140 <T	BDL	72.000	4.000	.	.
MAR	BDL	BDL	56.000	2.400	.	.
MAY	BDL	BDL	30.000	6.300	.	.
JUN	BDL	BDL	.	.	56.000	6.500
JUL	BDL	BDL	.	.	33.000	4.700
AUG	.060 <T	BDL	.	.	17.000	2.800
OCT	BDL	BDL	.	.	13.000	3.500
DEC	BDL	BDL	.	.	11.000	3.000
ANTIMONY (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 146 (D4)		
JAN	.280 <T	.160 <T	1.100	.180 <T	.	.
FEB	.350 <T	.360 <T	.730	.240 <T	.	.
MAR	.290 <T	.350 <T	.920	.290 <T	.	.
MAY	.330 <T	.290 <T	.420 <T	.340 <T	.	.
JUN	.220 <T	.240 <T	.	.	.500 <T	.350 <T
JUL	.200 <T	.300 <T	.	.	.500 <T	.300 <T
AUG	.310 <T	.340 <T	.	.	.500 <T	.420 <T
OCT	.300 <T	.330 <T	.	.	.420 <T	.440 <T
DEC	.290 <T	.430 <T	.	.	.490 <T	.360 <T
SELENIUM (UG/L)			DET'N LIMIT = 1.00	GUIDELINE = 10 (A1)		
JAN	BDL	1.100 <T	BDL	BDL	.	.
FEB	BDL	BDL	BDL	BDL	.	.
MAR	BDL	BDL	BDL	BDL	.	.
MAY	BDL	BDL	BDL	BDL	.	.
JUN	BDL	BDL	.	.	BDL	1.300 <T
JUL	BDL	BDL	.	.	1.200 <T	1.400 <T
AUG	BDL	BDL	.	.	BDL	BDL
OCT	BDL	BDL	.	.	BDL	BDL
DEC	BDL	BDL	.	.	BDL	BDL
STRONTIUM (UG/L)			DET'N LIMIT = 0.10	GUIDELINE = N/A		
JAN	230.000	230.000	220.000	220.000	.	.
FEB	240.000	240.000	230.000	240.000	.	.
MAR	260.000	250.000	260.000	260.000	.	.
MAY	210.000	210.000	200.000	200.000	.	.
JUN	220.000	210.000	.	.	210.000	210.000
JUL	220.000	230.000	.	.	220.000	220.000
AUG	220.000	210.000	.	.	220.000	210.000
OCT	250.000	240.000	.	.	230.000	240.000
DEC	210.000	210.000	.	.	210.000	210.000
TITANIUM (UG/L)			DET'N LIMIT = 0.50	GUIDELINE = N/A		
JAN	15.000	14.000	14.000	13.000	.	.
FEB	18.000	18.000	16.000	16.000	.	.
MAR	17.000	15.000	16.000	16.000	.	.
MAY	24.000	24.000	25.000	24.000	.	.
JUN	29.000	28.000	.	.	28.000	30.000
JUL	13.000	12.000	.	.	12.000	11.000
AUG	24.000	22.000	.	.	24.000	23.000
OCT	13.000	13.000	.	.	13.000	12.000
DEC	13.000	14.000	.	.	14.000	13.000

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM THAMESVILLE WELL SUPPLY 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
URANIUM (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 100 (A1)		
JAN	.070 <T	BDL	BDL	BDL	.	.
FEB	.160 <T	.070 <T	.110 <T	.060 <T	.	.
MAR	.170 <T	.140 <T	.230 <T	.200 <T	.	.
MAY	.080 <T	.060 <T	.100 <T	.080 <T	.	.
JUN	BDL	.070 <T	.	.	.070 <T	BDL
JUL	.070 <T	BDL	.	.	.060 <T	BDL
AUG	.070 <T	.070 <T	.	.	.110 <T	.060 <T
OCT	.260 <T	.260 <T	.	.	.160 <T	.180 <T
DEC	.070 <T	.080 <T	.	.	.100 <T	.080 <T
VANADIUM (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = N/A		
JAN	.190 <T	.220 <T	.180 <T	.120 <T	.	.
FEB	.300 <T	.380 <T	.180 <T	.370 <T	.	.
MAR	.150 <T	.090 <T	.100 <T	.120 <T	.	.
MAY	.160 <T	BDL	.080 <T	BDL	.	.
JUN	.140 <T	BDL	.	.	.060 <T	BDL
JUL	.240 <T	.180 <T	.	.	.270 <T	.240 <T
AUG	.150 <T	BDL	.	.	BDL	.060 <T
OCT	.090 <T	BDL	.	.	BDL	BDL
DEC	.110 <T	BDL	.	.	BDL	BDL
ZINC (UG/L)			DET'N LIMIT = 0.20	GUIDELINE = 5000 (A3)		
JAN	1.500 <T	2.200	140.000	12.000	.	.
FEB	1.700 <T	3.000	83.000	9.500	.	.
MAR	1.600 <T	2.300	210.000	11.000	.	.
MAY	1.300 <T	1.900 <T	450.000	130.000	.	.
JUN	20.000	1.900 <T	.	.	930.000	310.000
JUL	1.200 <T	1.600 <T	.	.	730.000	140.000
AUG	.720 <T	1.200 <T	.	.	660.000	180.000
OCT	2.700	2.200	.	.	230.000	210.000
DEC	.850 <T	1.200 <T	.	.	1000.000	100.000

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM THAMESVILLE WELL SUPPLY 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
CHLOROAROMATICS						
HEXACHLOROETHANE (NG/L)			DET'N LIMIT = 1.000		GUIDELINE = 1900 (D4)	
JAN	BDL	BDL	.	BDL	.	.
FEB	BDL	BDL	.	BDL	.	.
MAR	BDL	BDL	.	BDL	.	.
MAY	IIS	BDL	.	BDL	.	.
JUN	BDL	BDL	.	.	.	BDL
JUL	BDL	BDL	.	.	.	BDL
AUG	IIS	BDL	.	.	.	BDL
OCT	BDL	BDL	.	.	.	BDL
DEC	BDL	7.000 <T	.	.	.	BDL

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM THAMESVILLE WELL SUPPLY 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
PHENOLICS (UG/L PHENOLICS)			DET'N LIMIT = .200	GUIDELINE = 2 (A4)		
JAN	BDL	BDL	.	.	.	.
FEB	.600 <T	1.000	.	.	.	.
MAR	.600 <T	BDL	.	.	.	.
MAY	BDL	3.000	.	.	.	.
JUN	BDL	BDL	.	.	.	.
JUL	BDL	.800 <T	.	.	.	.
AUG	BDL	BDL	.	.	.	.
OCT	1.000 <T	.400 <T	.	.	.	.
DEC	1.000	2.000	.	.	.	.

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM THAMESVILLE WELL SUPPLY 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
VOLATILES						
BENZENE (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 5 (A1)		
JAN	BDL	BDL	.	BDL	.	.
FEB	BDL	BDL	.	BDL	.	.
MAR	.050 <T	BDL	.	BDL	.	.
MAY	BDL	BDL	.	.050 <T	.	.
JUN	BDL	BDL	.	.	.	BDL
JUL	BDL	BDL	.	.	.	.100 <T
AUG	BDL	BDL	.	.	.	.100 <T
OCT	BDL	BDL	.	.	.	BDL
DEC	BDL	BDL	.	.	.	BDL
ETHYLBENZENE (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 2.4 (A3)		
JAN	BDL	BDL	.	BDL	.	.
FEB	BDL	BDL	.	BDL	.	.
MAR	.100 <T	.100 <T	.	.100 <T	.	.
MAY	.050 <T	.050 <T	.	.050 <T	.	.
JUN	.150 <T	.150 <T	.	.	.	BDL
JUL	.050 <T	BDL	.	.	.	BDL
AUG	.100 <T	.050 <T	.	.	.	.200 <T
OCT	.050 <T	.050 <T	.	.	.	.100 <T
DEC	.050 <T	BDL	.	.	.	.050 <T
M-XYLENE (UG/L)			DET'N LIMIT = 0.10	GUIDELINE = 300 (A3*)		
JAN	BDL	BDL	.	BDL	.	.
FEB	BDL	BDL	.	BDL	.	.
MAR	BDL	BDL	.	BDL	.	.
MAY	BDL	BDL	.	BDL	.	.
JUN	BDL	BDL	.	.	.	BDL
JUL	BDL	BDL	.	.	.	BDL
AUG	BDL	BDL	.	.	.	.300 <T
OCT	BDL	BDL	.	.	.	.200 <T
DEC	BDL	BDL	.	.	.	BDL
O-XYLENE (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 300 (A3*)		
JAN	BDL	BDL	.	BDL	.	.
FEB	BDL	BDL	.	BDL	.	.
MAR	BDL	BDL	.	BDL	.	.
MAY	BDL	BDL	.	BDL	.	.
JUN	BDL	BDL	.	.	.	.050 <T
JUL	BDL	BDL	.	.	.	.050 <T
AUG	BDL	BDL	.	.	.	.200 <T
OCT	BDL	BDL	.	.	.	.200 <T
DEC	BDL	BDL	.	.	.	BDL
STYRENE (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 100 (D1)		
JAN	BDL	BDL	.	BDL	.	.
FEB	BDL	BDL	.	BDL	.	.
MAR	.200 <T	BDL	.	BDL	.	.
MAY	.150 <T	BDL	.	.050 <T	.	.
JUN	.250 <T	BDL	.	.	.	.100 <T
JUL	.100 <T	BDL	.	.	.	BDL
AUG	.200 <T	BDL	.	.	.	.450 <T
OCT	.100 <T	BDL	.	.	.	.100 <T
DEC	.100 <T	BDL	.	.	.	.100 <T

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM THAMESVILLE WELL SUPPLY 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
CHLOROFORM (UG/L)			DET'N LIMIT = 0.10	GUIDELINE = 350 (A1+)		
JAN	BDL	77.300	.	62.900	.	.
FEB	BDL	85.000	.	72.200	.	.
MAR	BDL	53.100	.	43.100	.	.
MAY	BDL	50.000	.	50.800	.	.
JUN	BDL	77.800	.	.	.	56.200
JUL	BDL	66.600	.	.	.	61.600
AUG	BDL	50.900	.	.	.	47.400
OCT	BDL	35.300	.	.	.	32.400
DEC	BDL	35.600	.	.	.	41.800
DICHLOROBROMOMETHANE (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 350 (A1+)		
JAN	BDL	19.000	.	16.800	.	.
FEB	BDL	19.800	.	18.550	.	.
MAR	BDL	16.150	.	14.250	.	.
MAY	BDL	14.450	.	13.950	.	.
JUN	BDL	19.150	.	.	.	16.150
JUL	BDL	15.550	.	.	.	14.950
AUG	BDL	16.650	.	.	.	14.200
OCT	BDL	12.100	.	.	.	10.950
DEC	BDL	11.550	.	.	.	12.850
CHLORODIBROMOMETHANE (UG/L)			DET'N LIMIT = 0.10	GUIDELINE = 350 (A1+)		
JAN	BDL	2.300	.	2.300	.	.
FEB	BDL	3.500	.	3.600	.	.
MAR	BDL	3.200	.	3.100	.	.
MAY	BDL	2.900	.	2.700	.	.
JUN	BDL	3.300	.	.	.	3.100
JUL	BDL	2.500	.	.	.	2.500
AUG	BDL	3.400	.	.	.	3.200
OCT	BDL	3.000	.	.	.	2.800
DEC	BDL	2.200	.	.	.	2.500
TOTL TRIHALOMETHANES (UG/L)			DET'N LIMIT = 0.50	GUIDELINE = 350 (A1)		
JAN	BDL	98.600	.	82.000	.	.
FEB	BDL	108.300	.	94.350	.	.
MAR	BDL	72.450	.	60.450	.	.
MAY	BDL	67.350	.	67.450	.	.
JUN	BDL	100.200	.	.	.	75.450
JUL	BDL	84.650	.	.	.	79.050
AUG	BDL	70.950	.	.	.	64.800
OCT	BDL	50.400	.	.	.	46.150
DEC	BDL	49.300	.	.	.	57.150

TRACE LEVELS OF TOLUENE ARE LABORATORY ARTIFACTS DERIVED FROM THE ANALYTICAL METHODOLOGY.

TRACE LEVELS OF STYRENE ARE CONSIDERED TO BE LABORATORY ARTIFACTS RESULTING FROM THE LABORATORY SHIPPING CONTAINERS.

TABLE 6
DRINKING WATER SURVEILLANCE PROGRAM 1990

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE
BACTERIOLOGICAL			
FECAL COLIFORM MEMBRANE FILTRATION	CT/100ML	0	0 (A1)
STANDARD PLATE COUNT MEMBRANE FILT.	CT/ML	0	500/ML (A3)
TOTAL COLIFORM BACKGROUND MF	CT/100ML	0	N/A
TOTAL COLIFORM MEMBRANE FILTRATION	CT/100ML	0	5/100ML (A1)
CHEMISTRY (FLD)			
FIELD COMBINED CHLORINE RESIDUAL	MG/L	0	N/A
FIELD TOTAL CHLORINE RESIDUAL	MG/L	0	N/A
FIELD FREE CHLORINE RESIDUAL	MG/L	0	N/A
FIELD PH	DMNSLESS	N/A	6.5-8.5 (A3)
FIELD TEMPERATURE	DEG.C	N/A	15.0 (A3)
FIELD TURBIDITY	FTU	N/A	1.0 (A1)
CHEMISTRY (LAB)			
ALKALINITY	MG/L	0.2	30-500 (A3)
AMMONIUM TOTAL	MG/L	0.002	0.05 (F2)
CALCIUM	MG/L	0.2	100 (F2)
CHLORIDE	MG/L	0.2	250 (A3)
COLOUR	TCU	0.5	5.0 (A3)
CONDUCTIVITY	UMHO/CM	1.0	400 (F2)
CYANIDE	MG/L	0.001	0.2 (A1)
DISSOLVED ORGANIC CARBON	MG/L	0.1	5.0 (A3)
FLUORIDE	MG/L	0.01	2.4 (A1)
HARDNESS	MG/L	0.5	80-100 (A4)
LANGELIERS INDEX	DMNSLESS	N/A	N/A
MAGNESIUM	MG/L	0.1	30.0 (F2)
NITRITE	MG/L	0.001	1.0 (A1)
NITROGEN TOTAL KJELDAHL	MG/L	0.02	N/A
PH	DMNSLESS	N/A	6.5-8.5 (A4)
PHOSPHORUS FIL REACT	MG/L	0.0005	N/A
PHOSPHORUS TOTAL	MG/L	0.002	0.4 (F2)
SODIUM	MG/L	0.2	200 (A4)
SULPHATE	MG/L	0.2	500 (A3)
TOTAL NITRATES	MG/L	0.005	10.0 (A1)
TURBIDITY	FTU	0.05	1.0 (A1)
CHLOROAROMATICS			
123 TRICHLOROBENZENE	NG/L	5.0	N/A
1234 TETRACHLOROBENZENE	NG/L	1.0	N/A
1235 TETRACHLOROBENZENE	NG/L	1.0	N/A
124 TRICHLOROBENZENE	NG/L	5.0	10000 (I)
1245-TETRACHLOROBENZENE	NG/L	1.0	38000 (D4)
135 TRICHLOROBENZENE	NG/L	5.0	N/A
236 TRICHLOROTOLUENE	NG/L	5.0	N/A
245 TRICHLOROTOLUENE	NG/L	5.0	N/A
26A TRICHLOROTOLUENE	NG/L	5.0	N/A
HEXACHLOROBENZENE	NG/L	1.0	10 (C1)
HEXACHLOROBUTADIENE	NG/L	1.0	450 (D4)
HEXACHLOROCYCLOPENTADIENE	NG/L	5.0	206000 (D4)
HEXACHLOROETHANE	NG/L	1.0	1900 (D4)
OCTACHLOROSTYRENE	NG/L	1.0	N/A
PENTACHLOROBENZENE	NG/L	1.0	74000 (D4)
CHLOROPHENOLS			
234 TRICHLOROPHENOL	NG/L	100.0	N/A
2345 TETRACHLOROPHENOL	NG/L	20.0	N/A
2356 TETRACHLOROPHENOL	NG/L	10.0	N/A

TABLE 6
DRINKING WATER SURVEILLANCE PROGRAM 1990

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE
245 TRICHLOROPHENOL	NG/L	100.0	2600000 (D4)
246 TRICHLOROPHENOL	NG/L	20.0	5000 (A1)
PENTACHLOROPHENOL	NG/L	10.0	60000 (A1)
METALS			
ALUMINUM	UG/L	0.10	100 (A4)
ANTIMONY	UG/L	0.05	146 (D4)
ARSENIC	UG/L	0.10	25 (A1)
BARIUM	UG/L	0.05	1000 (A2)
BERYLLIUM	UG/L	0.05	6800 (D4)
BORON	UG/L	2.00	5000 (A1)
CADMIUM	UG/L	0.05	5 (A1)
CHROMIUM	UG/L	0.50	50 (A1)
COBALT	UG/L	0.02	N/A
COPPER	UG/L	0.50	1000 (A3)
IRON	UG/L	6.00	300 (A3)
LEAD	UG/L	0.05	10 (A1)
MANGANESE	UG/L	0.05	50 (A3)
MERCURY	UG/L	0.02	1 (A1)
MOLYBDENUM	UG/L	0.05	N/A
NICKEL	UG/L	0.20	350 (D3)
SELENIUM	UG/L	1.00	10 (A1)
SILVER	UG/L	0.05	50 (A1)
STRONTIUM	UG/L	0.10	N/A
THALLIUM	UG/L	0.05	13 (D4)
TITANIUM	UG/L	0.50	N/A
URANIUM	UG/L	0.05	100 (A1)
VANADIUM	UG/L	0.05	N/A
ZINC	UG/L	0.20	5000 (A3)
PAH			
ANTHRACENE	NG/L	1.0	N/A
BENZO(A) ANTHRACENE	NG/L	20.0	N/A
BENZO(A) PYRENE	NG/L	5.0	10.0 (A1)
BENZO(B) CHRYSENE	NG/L	2.0	N/A
BENZO(B) FLUORANTHENE	NG/L	10.0	N/A
BENZO(E) PYRENE	NG/L	50.0	N/A
BENZO(G,H,I) PERYLENE	NG/L	20.0	N/A
BENZO(K) FLUORANTHENE	NG/L	1.0	N/A
CHRYSENE	NG/L	50.0	N/A
CORONENE	NG/L	10.0	N/A
DIBENZO(A,H) ANTHRACENE	NG/L	10.0	N/A
DIMETHYL BENZO(A) ANTHRACENE	NG/L	5.0	N/A
FLUORANTHENE	NG/L	20.0	42000.0 (D4)
INDENO(1,2,3-C,D) PYRENE	NG/L	20.0	N/A
PERYLENE	NG/L	10.0	N/A
PHENANTHRENE	NG/L	10.0	N/A
PYRENE	NG/L	20.0	N/A
PESTICIDES & PCB			
ALACHLOR (LASSO)	NG/L	500.0	5000 (A2)
ALDRIN	NG/L	1.0	700 (A1)
ALPHA HEXACHLOROCYCLOHEXANE (BHC)	NG/L	1.0	700 (G)
ALPHA CHLORDANE	NG/L	2.0	7000 (A1)
AMETRINE	NG/L	50.0	300000 (D3)
ATRATONE	NG/L	50.0	N/A
ATRAZINE	NG/L	50.0	60000 (A2)
DES ETHYL ATRAZINE	NG/L	200.0	60000 (A2)
BETA HEXACHLOROCYCLOHEXANE (BHC)	NG/L	1.0	300 (G)
CYANAZINE (BLADEX)	NG/L	100.0	10000 (A2)
O,P-DDD	NG/L	5.0	10 (I)
DIELDRIN	NG/L	2.0	700 (A1)
ENDOSULFAN 1 (THIODAN I)	NG/L	2.0	74000 (D4)
ENDOSULFAN 2 (THIODAN II)	NG/L	5.0	74000 (D4)

TABLE 6
DRINKING WATER SURVEILLANCE PROGRAM 1990

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE
ENDOSULFAN SULPHATE (THIODAN SULPHATE)	NG/L	5.0	N/A
ENDRIN	NG/L	5.0	1600 (D3)
GAMMA CHLORDANE	NG/L	2.0	7000 (A1)
HEPTACHLOR	NG/L	1.0	3000 (A1)
HEPTACHLOR EPOXIDE	NG/L	1.0	3000 (A1)
LINDANE (GAMMA BHC)	NG/L	1.0	4000 (A1)
METHOXYCHLOR	NG/L	5.0	900000 (A1)
METOLACHLOR	NG/L	500.0	50000 (A2)
METRIBUZIN (SENCOR)	NG/L	100.0	80000 (A1)
MIREX	NG/L	5.0	N/A
P,P-DDD	NG/L	5.0	N/A
O,P-DDT	NG/L	5.0	30000 (A1)
OXYCHLORDANE	NG/L	2.0	N/A
PCB	NG/L	20.0	3000 (A2)
PPDDE	NG/L	1.0	30000 (A1)
PPDDT	NG/L	5.0	30000 (A1)
PROMETONE	NG/L	50.0	52500 (D3)
PROMETRYNE	NG/L	50.0	1000 (A2)
PROPAZINE	NG/L	50.0	700000 (D3)
SIMAZINE	NG/L	50.0	10000 (A2)
D-ETHYL SIMAZINE	NG/L	200.0	10000 (A2)
TOXAPHENE	NG/L	500.0	5000 (A1)
PHENOLICS			
PHENOLICS (UNFILTERED REACTIVE)	UG/L	0.2	2 (A4)
SPECIFIC PESTICIDES			
2,4 D PROPIONIC ACID	NG/L	100.	N/A
2,4,5-TRICHLOROPHENOXY ACETIC ACID	NG/L	50.	280000 (A1)
2,4-DICHLOROBUTYRIC ACID (2,4-D)	NG/L	100.	100000 (A1)
24-DICHLORORPHENOXYBUTYRIC ACID (24-DB)	NG/L	200.	18000 (B3)
BUTYLATE (SUTAN)	NG/L	2000.	245000 (D3)
CARBARYL (SEVIN)	NG/L	200.	90000 (A1)
CARBOFURAN	NG/L	2000.	90000 (A1)
CHLORPYRIFOS (DURSBAN)	NG/L	20.	N/A
CICP (CHLORPROPHAM)	NG/L	2000.	350000 (G)
DIALLATE	NG/L	2000.	N/A
DIAZINON	NG/L	20.	20000 (A1)
DICAMBA	NG/L	50.	120000 (A1)
DICHLOROVOS	NG/L	20.	N/A
EPTAM	NG/L	2000.	N/A
ETHION	NG/L	20.	35000 (G)
IPC	NG/L	2000.	N/A
MALATHION	NG/L	20.	190000 (A1)
METHYL PARATHION	NG/L	50.	7000 (B3)
METHYLTRITHION	NG/L	20.	N/A
MEVINPHOS	NG/L	20.	N/A
PARATHION	NG/L	20.	50000 (A1)
PHORATE (THIMET)	NG/L	20.	2000 (A2)
PROPOXUR (BAYGON)	NG/L	2000.	140000 (D3)
RELDAN	NG/L	20.	N/A
RONNEL	NG/L	20.	N/A
SILVEX (2,4,5-TP)	NG/L	20.	10000 (A1)
VOLATILES			
1,1 DICHLOROETHANE	UG/L	0.10	N/A
1,1 DICHLOROETHYLENE	UG/L	0.10	7 (D1)
1,2 DICHLOROBENZENE	UG/L	0.05	200 (A1)
1,2 DICHLOROETHANE	UG/L	0.05	5 (A1)

TABLE 6
DRINKING WATER SURVEILLANCE PROGRAM 1990

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE
1,2 DICHLOROPROPANE	UG/L	0.05	5 (D1)
1,3 DICHLOROBENZENE	UG/L	0.10	3750 (D3)
1,4 DICHLOROBENZENE	UG/L	0.10	5 (A1)
111, TRICHLOROETHANE	UG/L	0.02	200 (D1)
112 TRICHLOROETHANE	UG/L	0.05	0.6 (D4)
1122 TETRACHLOROETHANE	UG/L	0.05	0.17(D4)
BENZENE	UG/L	0.05	5 (A1)
BROMOFORM	UG/L	0.20	350 (A1+)
CARBON TETRACHLORIDE	UG/L	0.20	5 (A1)
CHLOROBENZENE	UG/L	0.10	1510 (D3)
CHLORODIBROMOMETHANE	UG/L	0.10	350 (A1+)
CHLOROFORM	UG/L	0.10	350 (A1+)
DICHLOROBROMOMETHANE	UG/L	0.05	350 (A1+)
ETHLYENE DIBROMIDE	UG/L	0.05	50 (D1)
ETHYLBENZENE	UG/L	0.05	2.4 (A3)
M-XYLENE	UG/L	0.10	300 (A3*)
METHYLENE CHLORIDE	UG/L	0.50	50 (A1)
O-XYLENE	UG/L	0.05	300 (A3*)
P-XYLENE	UG/L	0.10	300 (A3*)
STYRENE	UG/L	0.05	100 (D1)
TETRACHLOROETHYLENE	UG/L	0.05	5 (D1)
TRANS 1,2 DICHLOROETHYLENE	UG/L	0.10	70 (D1)
TOLUENE	UG/L	0.05	24 (A3)
TOTAL TRIHALOMETHANES	UG/L	0.50	350 (A1)
TRICHLOROETHYLENE	UG/L	0.10	50 (A1)

Appendix A

DRINKING WATER SURVEILLANCE PROGRAM
PROGRAM DESCRIPTION

The Drinking Water Surveillance Program (DWSP) for Ontario monitors drinking water quality at municipal water supply systems. The DWSP Database Management System provides a computerized drinking water quality information system for the supplies monitored. The objectives of the program are to provide:

- immediate, reliable, current information on drinking water quality;
- a flagging mechanism for guideline exceedance;
- a definition of contaminant levels and trends;
- a comprehensive background for remedial action;
- a framework for assessment of new contaminants; and
- an indication of treatment efficiency of plant processes.

PROGRAM

The DWSP officially began in April 1986 and is designed to eventually include all municipal water supplies in Ontario. In 1990, 76 systems were being monitored. Water supply locations have been prioritized for surveillance based primarily on criteria such as population density, probability of contamination and geographical location.

An ongoing assessment of future monitoring requirements at each location will be made. Monitoring will continue at the initial locations at an appropriate level and further locations will be phased into the program as resources permit.

A major goal of the program is to collect valid water quality data in context with plant operational characteristics at the time of sampling. As soon as sufficient data have been accumulated and analyzed, both the frequency of sampling and the range of parameters may be adjusted accordingly.

Assessments are carried out at all locations prior to initial sampling, in order to acquire complete plant process and distribution system details and to designate (and retrofit if necessary) all sampling systems and locations. This ensures that the sampled water is a reflection of the water itself.

Samples are taken of raw (ambient water) and treated water at the treatment plant and of consumer's tap water in the distribution system. In order to determine possible effects of distribution on water quality, both standing and free flow water in old and new sections of the distribution system are sampled. Sampling is carried out by operational personnel who have been trained in applicable procedures.

Comprehensive standardized procedures and field test kits are supplied to sampling personnel. This ensures that samples are taken and handled according to standard protocols and that field testing will supply reliable data. All field and laboratory analyses are carried out using "approved documented procedures". Most laboratory analyses are carried out by the Ministry of Environment (MOE), Laboratory Services Branch. Radionuclides are analyzed by the Ministry of Labour.

DATA REPORTING MECHANISM

When the analytical results are transferred from the MOE laboratory into the DWSP system, printouts of the completed analyses are sent to the MOE District Officer, the appropriate operational staff and are also retained by the DWSP unit.

PROGRAM INPUTS AND OUTPUTS

There are four major inputs and four major outputs in the program.

Program Input - Plant and Distribution System Description

The system description includes plant specific non-analytical information acquired through a questionnaire and an initial plant visit. During the initial assessment of the plant and distribution system, questionnaire content is verified and missing information added. It is intended that all data be kept current with scheduled annual updates.

The Plant and Distribution System Description consists of the following seven components:

1. PROCESS COMPONENT INVENTORY

All physical and chemical processes to which the water is subjected, from the intake pipe to the consumers' tap (where possible), are documented. These include: process type, general description of physical structures, material types, sizes, and retention time for each process within the plant. The processes may be as simple as transmission or as complex as carbon adsorption.

2. TREATMENT CHEMICALS

Chemicals used in the treatment processes, their function, application point, supplier and brand-name are recorded. Chemical dosages applied on the day of sampling are recorded in DWSP.

3. PROCESS CONTROL MEASUREMENTS

Documentation of in-plant monitoring of process parameters (eg. turbidity, chlorine residuals, pH, aluminum residuals) including methods used, monitoring locations and frequency is contained in this section. Except for the recorded Field Data, in-plant monitoring results are not retained in DWSP but are retained by the water treatment plant personnel.

4. DESIGN FLOW AND RETENTION TIME

Hydraulic capacity, designed and actual, is noted here. Retention time (the time that a block of water is retained in the plant) is also noted. Maximum, minimum and average flow, as well as a record of the flow rate on the day of sampling, are recorded in DWSP.

5. DISTRIBUTION SYSTEM DESCRIPTION

This area includes the storage and transmission characteristics of the distribution system after the water leaves the plant.

6. SAMPLING SYSTEM

Each plant is assessed for its adequacy in terms of the sampling of bacteriological, organic and inorganic parameters. Prime considerations in the assessment and design of the sampling system are:

i/ the sample is an accurate representation of the actual water condition, eg. raw water has had no chemical treatment;

ii/ the water being sampled is not being modified by the sampling system;

iii/ the sample tap must be in a clean area of the plant, preferably a lab area; and

iv/ the sample lines must be organically inert (no plastic, ideally stainless steel).

It is imperative that the sampled water be a reflection not of the sampling system but of the water itself.

The sampling system documentation includes: origin of the water; date sampling was initiated; size, length and material type (intake,

discharge and tap); pump characteristics (model, type, capacity); and flow rate.

7. PERSONNEL

This section contains the names, addresses and phone numbers of current plant management and operational staff, distribution system management and operational staff, Medical Officer of Health and appropriate MOE personnel associated with the plant.

Program Input - Field Data

The second major input to DWSP is field data. Field data is collected at the plant and from the distribution system sites on the day of sampling. Field data consists of general operating conditions and the results of testing for field parameters. General operating conditions include chemicals used, dosages, flow and retention time on the day of sampling, as well as, monthly maximum, minimum and average flows. Field parameters include turbidity, chlorine residuals (free, combined and total), temperature and pH. These parameters are analyzed according to standardized DWSP protocols to allow for interplant comparison.

Program Input - Laboratory Analytical Data

The third major input to DWSP is Laboratory Analytical Data. Samples gathered from the raw, treated and distribution sampling sites are analyzed for the presence of approximately 180 parameters at a frequency of two to twelve times per year. Sixty-five percent of the parameters are organic. Parameters measured may have health or aesthetic implications when present in drinking water. Many of the parameters may be used in the treatment process or may be treatment by-products. Due to the nature of certain analytical instruments, parameters may be measured in a "scan" producing some results for parameters that are not on the DWSP priority list, but which may be of interest. The majority of parameters are measured on a routine basis. Those that are technically more difficult and/or costly to analyze, however, are done less frequently. These include Specific Pesticides and Chlorophenols.

Although the parameter list is extensive, additional parameters with the potential to cause health or aesthetic related problems may be added provided reliable analytical and sampling methods exist.

All laboratory generated data is derived from standardized, documented analytical protocols. The analytical method is an integral part of the data and as methods change, notation will be made and comparison data documented.

Program Input - Parameter Reference Information

The fourth major input to DWSP is Parameter Reference Information. This is a catalogue of information for each substance analyzed on DWSP. It includes parameter name and aliases, physical and chemical properties, basic toxicology, world-wide health limits, treatment methods and uses. The Parameter Reference Information is computerized and can be accessed through the Query function of the DWSP database. An example is shown in figure 1.

Program output - Query

All DWSP information is easily accessed through the Query function, therefore, anything from addresses of plant personnel to complete water quality information for a plant's water supply is instantly available. The DWSP computer system makes relatively complex inquiries manageable. A personal password allowing access into the DWSP query mode in all MOE offices is being developed by the DWSP group.

Program Output - Action Alerts

Drinking Water quality in Ontario is evaluated against provincial objectives as outlined in the Ontario Drinking Water Objectives publication. Should the reported level of a substance in treated water exceed the Ontario Drinking Water Objective, an "Action Alert" requiring resampling and confirmation is issued. This assures that operational staff, health authorities and the public are notified as soon as possible of the confirmation of an exceedance and remedial action taken. This report supplies a history of the occurrence of past exceedances at the plant plus a historical summary on the parameter of concern.

In the absence of Ontario Drinking Water Objectives, guidelines/limits from other agencies are used. The Parameter Listing System, published by MOE (ISBN 0-7729-4461-X), catalogues and keeps current guidelines for 650 parameters from agencies throughout the world. If these guidelines are exceeded, the results are flagged and evaluated by DWSP personnel. An "Action Alert" will be issued if warranted.

Program Output - Report Generation

Custom reports can be generated from DWSP to meet MOE Regional needs and to respond to public requests.

Program Output - Annual Reports

It is the practice of DWSP to produce an annual report containing analytical data along with companion plant information.

FIG.1

MOE - DRINKING WATER ASSESSMENT PROGRAM (DWSP)

PARAMETER REFERENCE INFORMATION

BENZENE (B2001P) VOLATILES

CLASS: HEALTH METHOD: POCODO UNIT: µg/L

SOURCE	FROM	TO	METHOD	GUIDELINE	UNIT	NOTE
CAL C	85/01			0.700	µg/L	AL
CDWG C	87/01			5.000	µg/L	MAC
EPA C	87/07			5.000	µg/L	MCL
EPAA C	80/11			6.600	µg/L	AMBIENT **
FERC C	84/05			1.000	µg/L	MCL
WHO C	84/01			10.000	µg/L	GV

DESCRIPTION:**NAME:** BENZENE

CAS#: 71-43-2

MOLECULAR FORMULAE: C_6H_6

DETECTION LIMIT: (FOR METHOD POCODO) 0.05 µg/L

SYNONYMS: BENZOL; BENZOLE; COAL NAPHTHA; CARBON OIL (27). CYCLOHEXATRIENE (41).

CHARACTERISTICS: COLOURLESS TO LIGHT-YELLOW, MOBILE, NON-POLAR LIQUID, OF HIGHLY REFRACTIVE NATURE, AROMATIC ODOUR; VAPOURS BURN WITH SMOKING FLAME (30).

PROPERTIES: SOLUBILITY IN WATER: 1780-1800 mg/L AT 25C (41). THRESHOLD ODOUR: 0.5 - 10 PPM IN WATERTHRESHOLD TASTE: 0.5 mg/L IN WATER (39).
ENVIRONMENTAL FATE: MAY BIOACCUMULATE IN LIVING ORGANISMS AND APPEARS TO ACCUMULATE IN ANIMAL TISSUES THAT EXHIBIT A HIGH LIPID CONTENT OR REPRESENT MAJOR METABOLIC SITES, SUCH AS LIVER OR BRAIN; SMALL QUANTITIES EVAPORATE FROM SOILS OR ARE DEGRADED RATHER QUICKLY (80).

SOURCES: COMMERCIAL: PETROLEUM REFINING; SOLVENT RECOVERY; COAL TAR DISTILLATION (39); FOOD PROCESSING AND TANNING INDUSTRIES; COMBUSTION OF CAR EXHAUST.
ENVIRONMENTAL: POSSIBLE SOURCE IS RUNOFF.

USES: DETERGENTS; NYLON; INTERMEDIATE IN PRODUCTION OF

OTHER COMPOUNDS, SUCH AS PESTICIDES; SOLVENT FOR EXTRACTION AND RECTIFICATION IN RUBBER INDUSTRY; DEGREASING AND CLEANSING AGENT; GASOLINE.

TOXICITY: RATING: 4 (VERY TOXIC).
ACUTE: IRRITATING TO MUCOUS MEMBRANES; SYMPTOMS INCLUDE RESTLESSNESS, CONVULSIONS, EXCITEMENT, DEPRESSION; DEATH MAY FOLLOW RESPIRATORY FAILURE.
CHRONIC: MAY CAUSE ANAEMIA AND LEUKAEMIA (45); MUTAGENIC.
MODE OF ACTION: CHROMOABERRATION IN LYMPHOCYTE CULTURES.

CARCINOGENICITY: A KNOWN HUMAN CARCINOGEN.

REMOVAL: THE FOLLOWING PROCESSES HAVE BEEN SUCCESSFUL IN REMOVING BENZENE FROM WASTEWATER: GAC ADSORPTION, PRECIPITATION WITH ALUM AND SUBSEQUENT REMOVAL VIA SEDIMENTATION, COAGULATION AND FLOCCULATION, SOLVENT EXTRACTION, OXIDATION

ADDITIONAL PROPERTIES:
MOLECULAR WEIGHT: 78.12
MELTING POINT: 5.5°C (27).
BOILING POINT: 80.1°C (27).
SPECIFIC GRAVITY: 0.8790 AT 20°C (27).
VAPOUR PRESSURE: 100 MM AT 26.1°C (27).
HENRY'S LAW CONSTANT: 0.00555 ATM-M3/MOLE (41).
LOG OCT./WATER PARTITION COEFFICIENT: 1.95 TO 2.13 (39).
CARBON ADSORPTION: K=1.0; 1/N=1.6; R=0.97; PH=5.3 (41)SEDIMENT/WATER PARTITION COEFFICIENT: NO DATA

NOTES: EPA PRIORITY POLLUTANT.

Appendix B

DWSP SAMPLING GUIDELINE

i) Raw and Treated at Plant

General Chemistry	-500 mL plastic bottle (PET 500) -rinse bottle and cap with sample water three times -fill to 2 cm from top
Bacteriological	-220 mL plastic bottle with white seal on cap -do <u>not</u> rinse bottle, preservative has been added -avoid touching bottle neck or inside of cap -fill to top of red label as marked
Metals	-500 mL plastic bottle (PET 500) -rinse bottle and cap three times -fill to 2 cm from top -add 10 drops nitric acid (HNO_3) (**Caution:** HNO_3 is corrosive)
Volatiles (duplicates) (OPOPUP)	-45 mL glass vial with septum (teflon side must be in contact with sample) -do <u>not</u> rinse bottle -fill bottle completely without bubbles
Organics (OWOC),(OWTRI),(OAPAHX)	-1 L amber glass bottle per scan -do <u>not</u> rinse bottle -fill to 2 cm from top -when 'special pesticides' are requested three extra bottles must be filled
Cyanide	-500 mL plastic bottle (PET 500) -rinse bottle and cap three times

	-fill to 2 cm from top -add 10 drops sodium hydroxide (NaOH) (**Caution:** NaOH is corrosive)
Mercury	-250 mL glass bottle -rinse bottle and cap three times -fill to top of label -add 20 drops each nitric acid (HNO_3) and potassium dichromate ($K_2Cr_2O_7$) (**Caution:** HNO_3&$K_2Cr_2O_7$ are corrosive)
Phenols	-250 mL glass bottle -do <u>not</u> rinse bottle, preservative has been added -fill to top of label
Radionuclides (as scheduled)	-4 L plastic jug -do <u>not</u> rinse, carrier added -fill to 5 cm from top
Organic Characterization (GC/MS - once per year)	-1 L amber glass bottle; instructions as per organic -250 mL glass bottle -do <u>not</u> rinse bottle -fill completely without bubbles

<u>Steps:</u>

1. Let sampling water tap run for an adequate time to clear the sample line.

2. Record time of day on submission sheet.

3. Record temperature on submission sheet.

4. Fill up all bottles as per instructions.

5. Record chlorine residuals (free, combined and total for treated water only), turbidity and pH on submission sheet.

ii) Distribution Samples (standing water)

General Chemistry	-500 mL plastic bottle (PET 500) -rinse bottle and cap with sample water three times -fill to 2 cm from top
Metals	-500 mL plastic bottle (PET 500) -rinse bottle and cap three times -fill to 2 cm from top -add 10 drops nitric acid (HNO_3) (**Caution:** HNO_3 is corrosive)

Steps:

1. Record time of day on submission sheet.
2. Place bucket under tap and open cold water.
3. Fill to predetermined volume.
4. After mixing the water, record the temperature on the submission sheet.
5. Fill general chemistry and metals bottles.
6. Record chlorine residuals (free, combined and total), turbidity and pH on submission sheet.

iii) Distribution Samples (free flow)

General Chemistry	-500 mL plastic bottle (PET 500) -rinse bottle and cap with sample water three times -fill to 2 cm from top
Bacteriological	-250 mL plastic bottle with white seal on cap -do not rinse bottle, preservative has been added -avoid touching bottle neck or inside of cap -fill to top of red label as marked

Metals	-500 mL plastic bottle (PET 500) -rinse bottle and cap three times -fill to 2 cm from top -add 10 drops nitric acid HNO_3 (**Caution:** HNO_3 is corrosive)
Volatiles (duplicate) (OPOPUP)	-45 mL glass vial with septum (teflon side must be in contact with sample) -do <u>not</u> rinse bottle, preservative has been added -fill bottle completely without bubbles
Organics (OWOC) (OAPAHX)	-1 L amber glass bottle per scan -do <u>not</u> rinse bottle -fill to 2 cm from top

<u>Steps:</u>

1. Record time of day on submission sheet.

2. Let cold water flow for five minutes.

3. Record temperature on submission sheet.

4. Fill all bottles as per instructions.

5. Record chlorine residuals (free, combined and total), turbidity and pH on submission sheet.